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Special Tools and Fixtures in a Southern Railroad Shop

Chuck for Holding Driving Boxes—An Expansion Mandrel—Fixture for Squaring Rod Brasses—A Multiple Toolholder—Chuck for Turning Packing Rings

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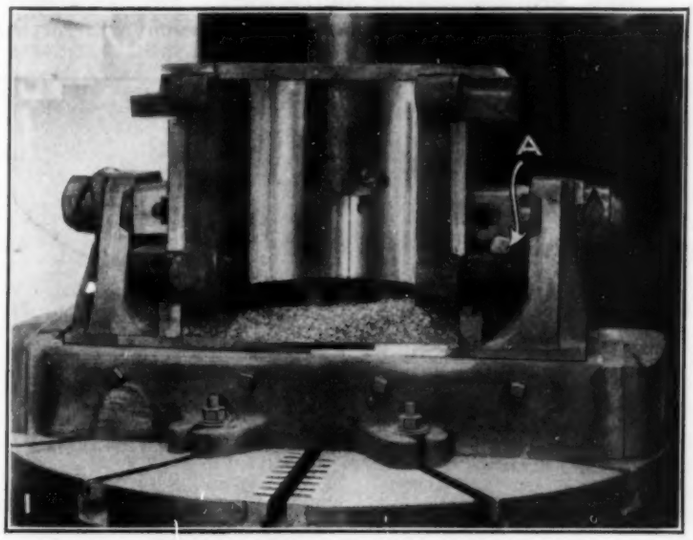
WHILE railroad repair shops have not been noted for progress in the use of special tools and fixtures for getting out repair parts for locomotives, a visit to some of the shops in the South has shown that their executives are fully alive to the advantages of tooling up for the work.

The tools and fixtures described and illustrated in this article are in use in the 17th St. shops of the Chesapeake & Ohio Railway, Richmond, Virginia.

Driving boxes are clumsy things to handle on the boring mill with no other holding arrangements besides the ordinary bolts, clamps and parallels. In Fig. 1 is shown a driving box mounted in a chuck on a boring mill. The chuck is a modification and enlargement of the two-jawed box chuck so well known to brass finishers and the wonder is that it was not adapted to heavy work long ago. However, it remained for F. B. Moss, assistant master mechanic of the Fulton Shops, East Richmond freight terminal, to develop the chuck in its present form. False jaws to accommodate work of almost any shape can be readily attached to the permanent jaws, thus adapting it to a variety of work. The driving box shown in the chuck rests on parallels and is forced down on them by wedges driven between the chuck jaws and the lower flanges of the box, as at *A*. The wedge on the opposite side of the box is driven in from the back and so is not visible in the illustration.

In some driving boxes in use on the locomotives of this road the crown brasses are made in two parts and spread by a wedge at the top of the crown to hold them tightly in place. Such a driving box is shown in the halftone, Fig. 2, and in detail in the line drawing, Fig. 3. No matter how tightly crown brasses are forced into driving boxes nor how well pinned in place, they will work loose in time can and be tightened only by putting in shims and new pins—a job that necessitates the removal of the boxes from the frames. In boxes such as shown in Figs. 2 and 3 the crown brasses can be tightened at any time on the road by drawing in the wedge.



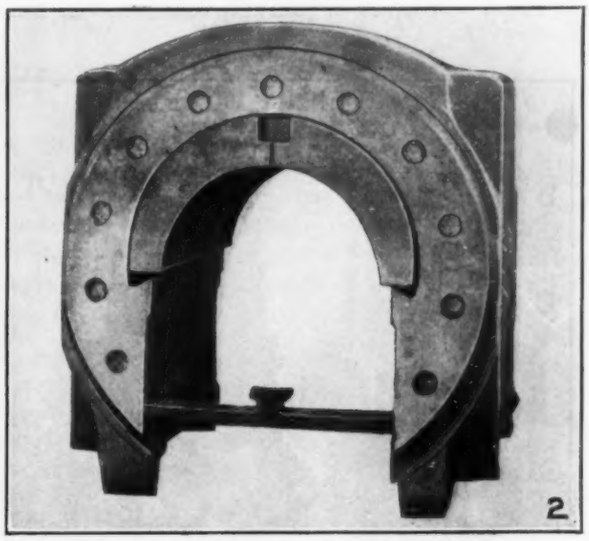


FIG. 1. CHUCK FOR HOLDING DRIVING BOXES. FIG. 2. DRIVING BOX WITH TWO-PART CROWN BRASS

A smaller chuck of the Moss type, arranged for boring rod brasses, is shown in Fig. 4. False jaws in the form of V-blocks are used to hold the work and it will be noted that they are so mounted as to permit adjustment at a right-angle to the gripping axis of the chuck. Ability to shift the work in two directions makes the truing up an easy matter.

An expanding mandrel operated by a three-lobed cam in connection with rollers is shown in Fig. 5. The cam *A*, with lobes in the form of ratchet teeth, is an integral part of the mandrel body. The rollers *B* are mounted on arms pivotally attached to the plates *C* and *D*, which

are free to revolve within certain limits about the cam *A*, and it will be readily understood that motion in one direction or the other will cause the rollers to approach the cam, the motion being limited by a stop pin. To use the chuck, lower plate *D* is revolved so that the rollers are opposite the low points of the cam lobes and then locked by turning the handle *E*, when the work can be put in place. Turning the handle *E* in the opposite direction allows the spring to revolve the plates and move the rollers along the inclines of the cam until they grip the interior of the work. Any tendency to revolve the work by the pressure of the cut will further expand the rollers and tighten their grip. For various sizes of work, split shells such as shown at *G* and *H* are provided. The collars *I* and *K* are used to position short or recede from the center. The rollers are normally kept opposite the high points of the cam lobes by a spring in the lower plate *D* tending to revolve it around

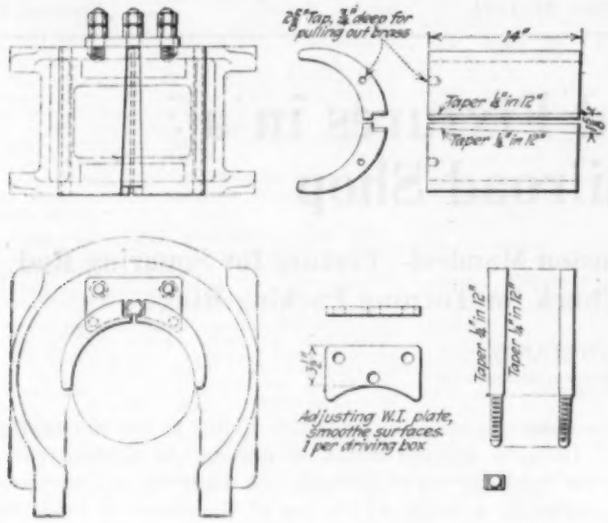


FIG. 3. DETAILS OF DRIVING BOX, CROWN BRASS AND WEDGE

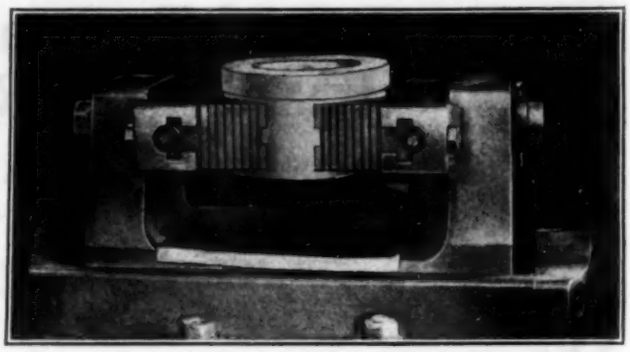


FIG. 4. SMALL MOSS CHUCK WITH V-JAWS

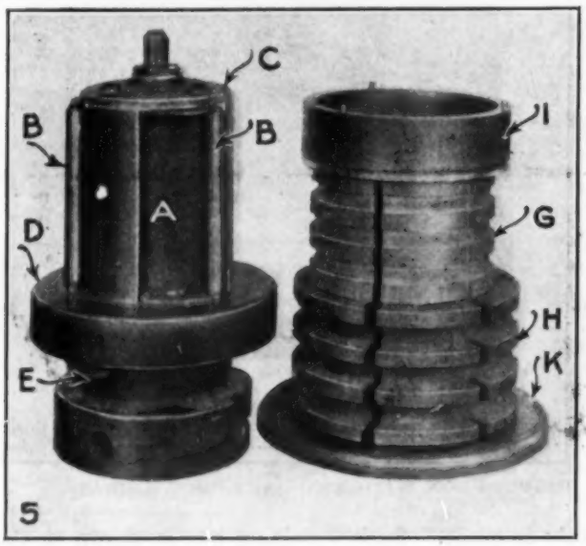


FIG. 5. A ROLLER-TYPE EXPANSION MANDREL.

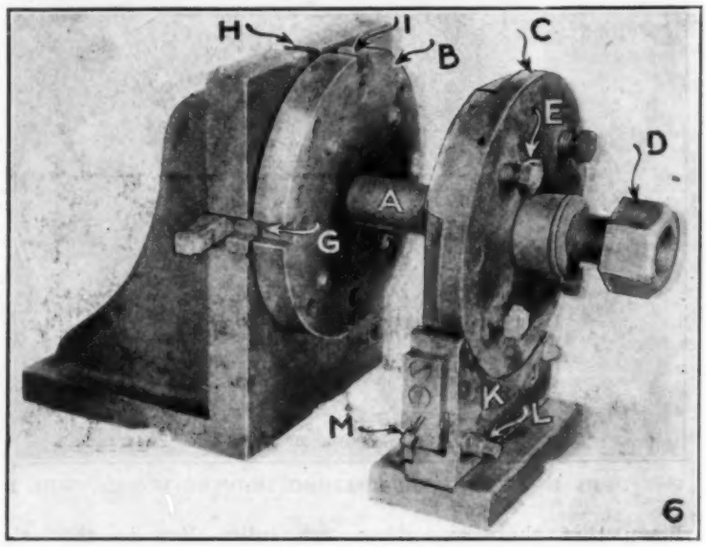


FIG. 6. FIXTURE FOR SQUARING ROD BRASSES

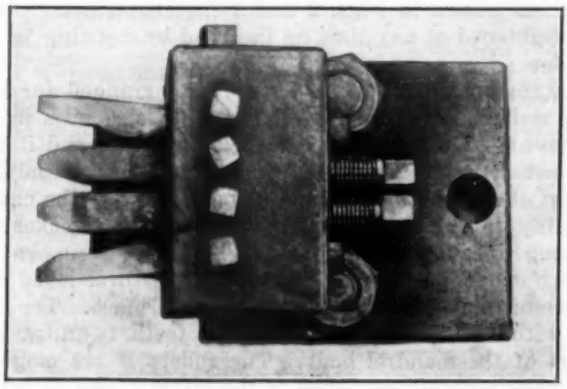


FIG. 7. TOOLS FOR SQUARING ROD BRASSES.

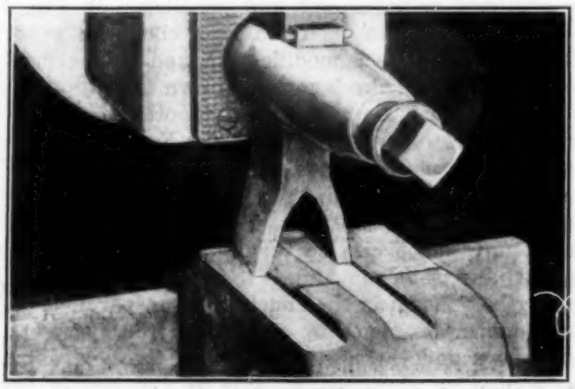


FIG. 8. SPLAYED TOOL FOR SHAPING BRASSES

work on the mandrel to allow facing the outer end. The mandrel can be attached either to the nose of a lathe spindle or to the threaded end of a base for mounting on the table of a boring mill.

Squaring Connecting-Rod Brasses

Flanged brasses for the crankpin ends of connecting rods are squared in a slotting machine and are held in the fixture shown in Fig. 6. The brass, either in one piece or in two pieces soldered together, is mounted on a bushing on the central arbor *A* and clamped between the cupped points of screws in plates *B* and *C*, by means of the nut *D*. Slippage under pressure of the cut is taken care of by tightening the screws *E*, in the outer plate, their cupped points and those of the screws in the inner plate biting into the softer metal of the work. Notches and latches are arranged as at *G* for indexing the work. It will be noted that the upper notches *H* and *I* do not match. This difference is made so that when the side latches are disengaged from their notches and a latch at the top engaged with notches *H* and *I*, the work will be thrown out of square to allow one side to be machined at an angle to fit the tapered adjusting key in the rod. This adjustment is made only when machining brasses without flanges to be fitted into rods machined from the solid and not provided with straps.

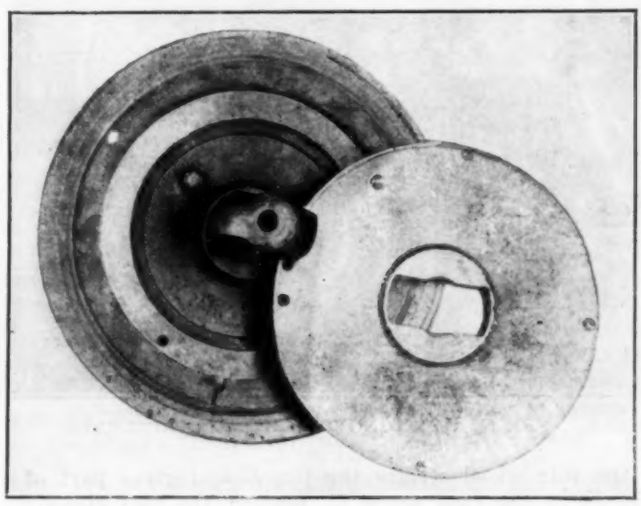


FIG. 9. CHUCK FOR TURNING AND FACING PACKING RINGS

The fixture is provided with an adjustable outboard support *K* to prevent springing under the downward thrust of the cutting tool, and is so arranged that it can be lowered to permit easy removal of the outer plate when taking off or putting on work. Adjustment is made by a cam on the shaft *L*, the construction being such that when the proper height is reached the cam can be rotated no further. The support can be locked in position by the screw *M*.

Multiple and Splayed Tools

A set of tools for machining flanged brasses in the slotting machine is shown in Fig. 7. The over-all distance of the outside tools is a little less than three-quarters of the width between the flanges of the brass. The outer tools are side tools and after one of them has finished the inside of one flange, the inside of the opposite flange is finished with the other tool. In finishing the body of the brass between the flanges the gang of tools is fed bodily in to the proper depth and then traversed. As the ends of all the tools are in the same plane, the amount of traverse necessary to machine the

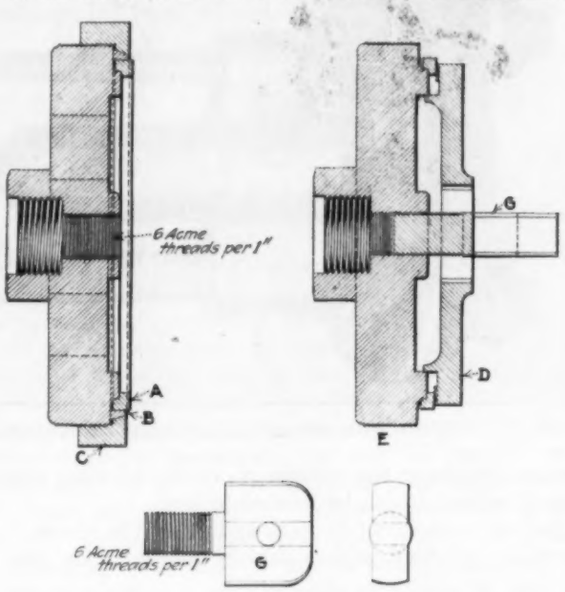


FIG. 10. DETAILS OF CHUCK, SHOWN IN FIG. 9

brass between the flanges is a little over one-quarter of the distance between them.

Small brasses without flanges are machined in a shaper by a splayed tool, as illustrated in Fig. 8, and it will be readily understood that a cut can be taken across the work by a tool traverse of about one-half the distance.

Turning and Facing Packing Rings

After a piece has been cut out of packing rings to give them a spring fit in the valve chamber, they must be compressed until the cut edges meet, turned to the proper diameter and faced on the edge where they were severed from the pot casting. A chuck for holding rings for this turning and facing is illustrated by the half-tone, Fig. 9, and in detail by the line-drawing, Fig. 10. The body of the chuck is provided with a projection to fit the notch in the side of the ring. When the ring *A*, Fig. 10, is in place inside the split tapered-ring *B*, the outer thread-ring *C* is screwed home, its tapered opening compressing both the taper ring and the packing ring. In this position the packing ring is held firmly and can be readily faced to the proper width. After facing, the cover *D* is put on as at *E* and clamped by the screw *G*. The outer and split rings can then be

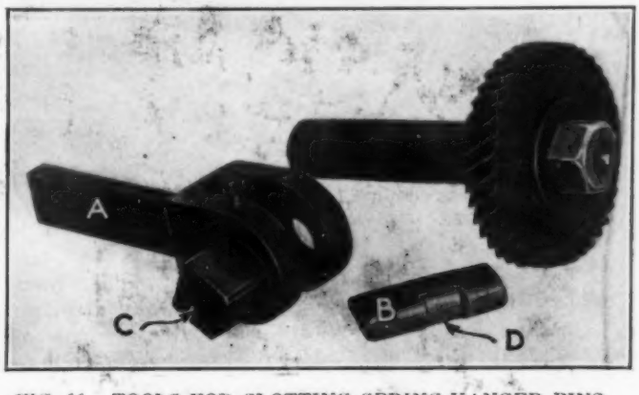


FIG. 11. TOOLS FOR SLOTTING SPRING-HANGER PINS

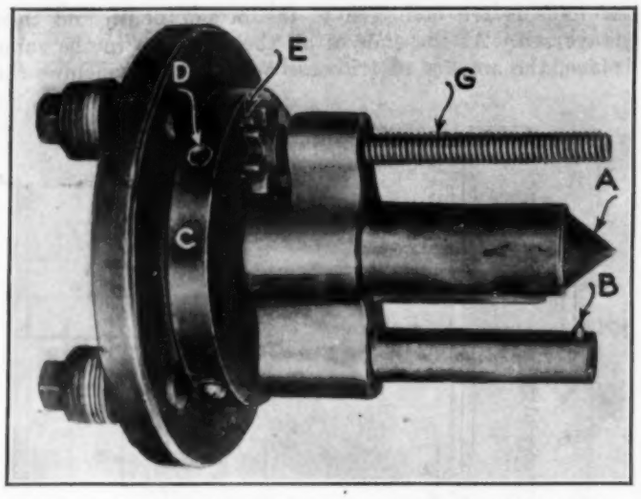


FIG. 12. DEVICE FOR TURNING LIFT-SHAFT JOURNALS

removed leaving the periphery of the packing ring exposed so that it can be turned to size.

Screw *G* need not be removed from the chuck as the cover is provided with a central hole of such size and shape as to allow it to pass over the oblong head of the screw.

A spring-hanger pin is a rough forging and the only machine work required to be done on it is the milling of a slot in one edge to catch in the spring eye and keep the pin from slipping out endwise. The tools for cutting this slot are shown in Fig. 11. The shank of the holder, *A* is held in the toolpost of a lathe and the pin *B* is placed through the oblong opening of the sleeve at *C*. With the milling cutter held between the lathe centers and the pin fed against it until the proper depth is reached, the sleeve *D* is rotated by a wrench on its squared end. As the pin rotates with the sleeve, the slot is milled with a convex bottom as at *E*.

Device for Turning Lift-Shaft Journals

Turning the journals on lift shafts under ordinary conditions requires a lathe of at least 40-in. swing and is an ugly job as the operator is liable to injury from the long projecting arms as they revolve. A device for turning lift-shaft journals while the shaft is held stationary is shown in Fig. 12. The device is fastened to the faceplate of a lathe, the center at *A* taking the place of the usual live center. With the lift shaft mounted between centers, and held stationary by the arms resting against the lathe bed, the journal is turned by the tool *B*. The collar *C* is held stationary by a pin screwed into the tapped hole *D* resting against any convenient part of the machine. As the rest of the device revolves, the star wheel strikes the pin *E* and gives part of a turn to the feed screw *G*, feeding the tool along the journal.

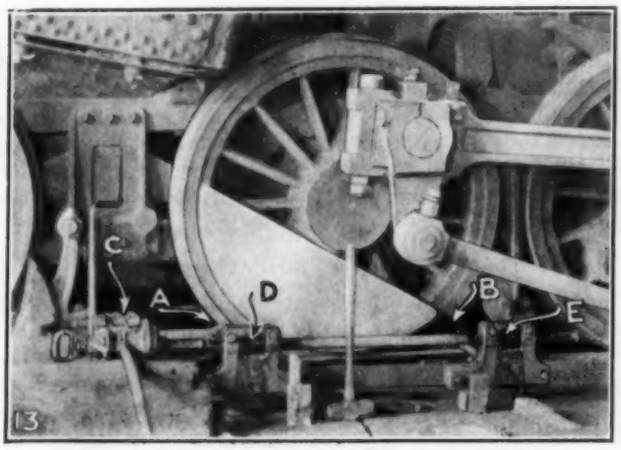


FIG. 13. APPARATUS FOR REVOLVING DRIVING WHEELS.

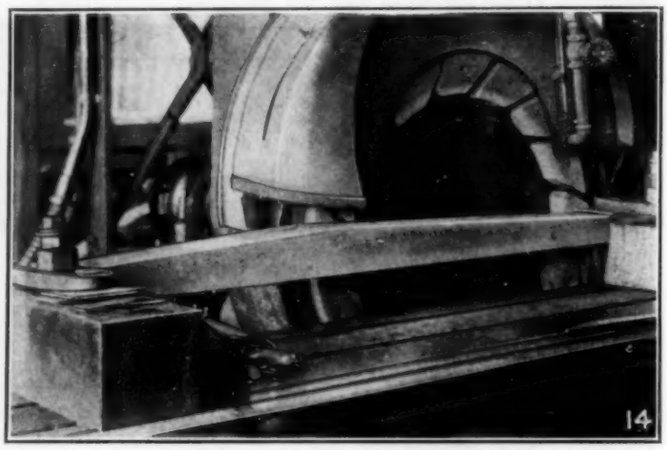


FIG. 14. GRINDING CROSSHEAD GUIDE-BARS

In Fig. 13 is shown an air-driven apparatus for revolving the driving wheels of a locomotive when setting the valves. One pair of driving wheels rests on rollers, two of which are located at *A* and *B*. The other rollers being under the driving wheel on the opposite side of the engine, are not visible. The rollers are driven by an air motor at *C* through worm gearing at *D* and *E*. This device is very convenient and besides saving time and labor, takes up but little storage room when not in use.

Crosshead guide-bars are trued up on a Diamond face-grinding machine, using abrasive blocks set in a chuck in place of a cupped wheel, as can be seen in Fig. 14.

Driving-wheel tires, when worn so that they are only fit for scrap, are removed from the wheel centers by cutting through with a gas torch. Fig. 15 shows a tire so cut, the cutting time being less than two minutes.

All the tools herein described, with the exception of the Moss chuck were either designed by or built under the direction of S. L. Gary, machine shop foreman.

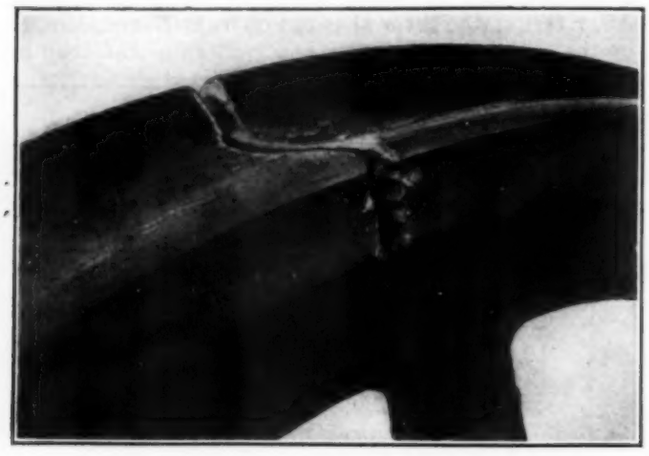


FIG. 15. TIRE CUT BY A GAS TORCH

Methods of Machine Tool Design

Conclusion of the First Article—Design of Commercial and Single-Purpose Machines Contrasted—Shorthand Symbols for the Designer

By A. L. DeLEEUW

PERHAPS the most essential thing the designer should keep in mind is that he must never try to solve more than one problem at a time; and while he is busy with the general problem of the construction of the machine he should not trouble his mind in regard to any details. He should simply take for granted that he will get what he needs for the building up of his scheme.

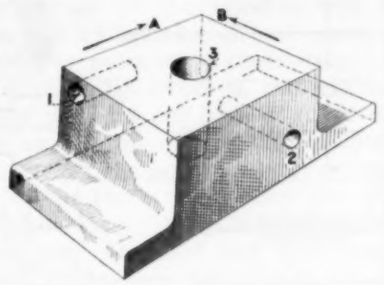


FIG. 1. SAMPLE PIECE TO BE MILLED AND DRILLED

To elucidate let us take an example. We are given a piece in which three holes must be drilled in three different planes and which must be milled in one of these planes, and we are asked to design a machine that will automatically perform these operations, but in which the piece will be chucked by hand. Fig. 1 represents this piece.

We see immediately that it will be a very simple matter to hold the piece during the operation. We must lay it up against a stop and we must bring clamps down on the projecting flanges. We notice that hole No. 3 is in the surface which must be milled, so that the milling and drilling cannot take place at the same time. An investigation of the piece shows us that the three holes do not intersect each other, so that it will be possible to drill all three at the same time. Knowing that it is not possible to do all operations at the same time, we will try to do the next best thing and have two operations, though, of course, with one setting.

Which Operation First?

The only question left to decide is this: Shall we first drill all holes and then mill; shall we first mill and then drill all holes; or shall we drill two holes and mill the surface and then drill the third hole? Suppose we make up our mind that there is no good reason why we should follow the third scheme and that there are several good reasons why we should not; reasons like this, for instance—that as we have a feed motion for two drills we might just as well employ this feed motion for the third drill also. Suppose, then, that we have eliminated the third choice. The question now is: Shall we first mill or drill?

Starting the drill for hole No. 3 will be facilitated if we mill first; it will also be possible to bring the jig-eye for this drill closer to the work. This seems to us to be a sufficient reason to adopt the first scheme, namely, mill first and drill afterward. We can now make a mental picture of the machine we will have.

There will be a surface on which the piece will be located, with the necessary stops and clamps. There will be two drill heads, one to the right and one in front for holes Nos. 2 and 1. This makes it probable that the loading side will be opposite hole No. 2. There will further be a slide, or slides, for the third drill spindle and for the milling spindle. It is not quite certain at the present whether we will use a spiral mill or an end mill. Considering this matter in a preliminary way we feel that the end mill will make a more open construction and perhaps somewhat simpler, and we therefore consider this construction as our first choice. However, we make a note of the fact that the other construction is also a possible one.

The drill spindle as well as the milling spindle must have a transverse movement; the one for getting into position and out of it, the other for the feed, and it seems reasonable to combine these two spindles in one slide. Of course, it would have been possible to make the milling spindle move in the direction of arrow *A* and the drill slide in the direction of arrow *B*, but we see no arguments in favor of such a construction. We will combine both slides into one, move the slide over by means of a cam while milling, and bring it to rest against a stop, after which the drill spindle will come into action.

Working Out the General Scheme

It should be noted that we have now before us a general scheme of a machine, but without any details. And it should be kept in mind that it may very well be possible that later on we may be induced to change this general scheme because one of the details offers so many difficulties that it is not wise to pursue the original plan. However, we will now use the plan as we have it, analyze it, and determine what are the different elements which we must provide.

So far as we have outlined this machine it is, in reality, a combination of machines; or, if one wishes to call it so, a combination of functional units: a unit for holding the piece, two units for drilling holes Nos. 1 and 2, and a unit for drilling hole No. 3 and for milling. Each of these units must be analyzed. So far as we can see no difficulties present themselves at all in regard to the means for locating and holding the piece. Each of the two drill spindles for holes Nos. 1 and 2 must have a driving and a feeding mechanism, and the unit for hole No. 3 and for milling must have two distinct driving and feeding mechanisms and a return for the slide to its original position. We take for granted that we will be able to meet all these requirements and do not trouble ourselves with doubts as to difficulties we may encounter.

Determining the construction of drill spindle for hole No. 1 we would follow a reasoning somewhat like this: This spindle has to drill only one size of hole and always to the same depth. Therefore, the spindle requires only one speed and one feed. And as the depth is always the same it is possible to accomplish this feeding by means of a cam. However, as the drill wears we would get holes of different depths unless we have some means either for adjusting the drill or the spindle or the cam, and we will keep this in mind.

We will not go further into this matter at the present time, as the foregoing seems to be sufficient to indicate the general line of thought we must follow and how we work closer and closer to the details as we go along, always keeping in mind that it may be necessary to change our plan in case we should meet an insurmountable difficulty.

Commercial Machine Presents Different Problem

The example we chose was that of a special machine, in which the requirements are very definite. We are confronted with an entirely different problem when we must design a commercial machine, or rather we should say, a general utility machine. Merely looking at the piece to be machined placed the requirements of the special machine before us in a very definite form. When it comes to the design of a general utility machine we have no starting point for an analysis of its requirements. In fact, determining the requirements of a general utility machine is not a part of the designer's work. This should be done by the sales department which, however, should consult with the designers as to the possibility or advisability of embodying certain features in the proposed design. It is regrettable but nevertheless very true that most lathe spindle bearings are not proportioned according to the best machine design practice, but according to the proportions of a similar spindle of a similar lathe made by the closest competitor. Whether this is good practice or not makes no difference; we may just as well recognize the fact that competition is one of the controlling factors in machine tool design and that the practice will continue until the buying public has been educated to a point where it can judge for itself as to the merits of a machine tool. Even now there seems to be some improvement along this line, caused by the fact that some of the larger concerns who buy machine tools entrust the work of specifying and analyzing to their engineering departments, leaving the commercial end of the buying to the purchasing department.

Though the designer of a commercial machine is much handicapped by these conditions, it must not be thought that there is no scope for his work. He has to proportion the machine and provide new features and mechanisms. He has to take into consideration the fact that a complete line of such machines may be built, either now or in the future. He should construct the machine so that some of the units can be used interchangeably on a number of sizes in the line and build his machine out of functional units, which may be combined in various ways so as to make up a number of styles of machines. For instance, a single feed box unit may be used for two or three sizes of machines; a single drill head may be used for a number of sizes of radial drills, etc.

Advantage of Interchangeable Units

The building of a machine out of interchangeable units becomes possible by dividing up a machine into functional units. We may have a unit for the drive, another for the feed, still another for quick traverse, another again for the supply of cutting compound, etc. Each of these units should be treated as a separate machine. It is only necessary to provide a place on the frame of the machine to which this unit can be bolted; and if a number of different machines all have the same bolting surface and the same means for connecting up with the mechanism contained in such a unit, it follows

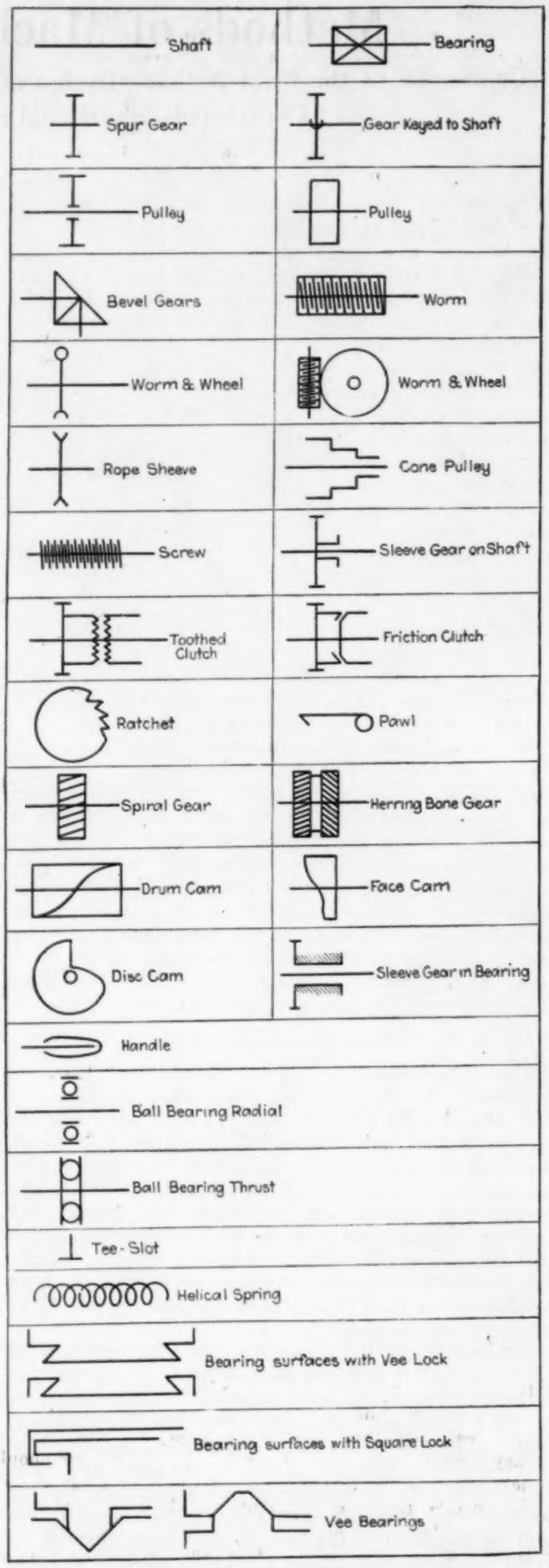


FIG. 2. DESIGNER'S SHORTHAND SYMBOLS

that that unit can be used on such a line of machines. This system of building machine tools as far as possible out of functional units leads to great economy in the building of the individual machine and makes possible an almost endless variety of combinations; in other words, it makes the line of machinery built by a manufacturer as elastic as it is possible to make it.

Some twenty or thirty years ago, if a new machine had to be developed, it was quite the customary thing for the proprietor of the machine tool establishment to hunt around in the pattern storage to see if he couldn't find some pattern which might be made the basis of the new machine. He was willing, of course, to make some slight modification in the pattern, but the idea that no new expensive pattern would have to be built for the main part of the machine was so alluring that this method of starting a new machine tool was quite the regular practice in those days. It was left to the unfortunate newcomer in the machine tool business, the man who did not have a lot of old scrap patterns lying around, to design the machines from the ground up, and, in the opinion of the writer, this may have been one of the main reasons why the most important developments in machine tool design did not originate with the older and best established concerns.

It is almost unnecessary to say that the old practice, should it still exist, must be abandoned. *The frame of a machine must be built around its mechanism, and not the mechanism into the frame.* There is not so much danger at the present time that the old method will be followed. Thirty years ago practically all of the mechanism of a machine was hung on the outside of the frame, and it was a simple matter to adapt the frame to a new kind of mechanism merely by changing a few bosses or pads. Nowadays it is customary to have the mechanism completely covered, preferably by the frame itself, so that changing over from one mechanism to another almost necessarily means the making of a new frame.

Mention was made of the necessity of confining the mind to one problem. The human mind is so constructed that it cannot contemplate more than one thing at a time. However, when analyzing a problem the designer will naturally find a number of items which are not obvious and which he must solve, and it may well be that in solving one item a certain way he makes the solution of another item more difficult or even impossible. Nevertheless, he must take up one item at a time. When he has solved number one he should go on and solve number two, and then check the one by the other; after which he can go on with number three and check its solution by number one and number two. It may often be that the designer finds more than one solution for a single problem. If he does, he should select one which appears best to him, but make a note of the others, so that, if he should find later that the first solution selected by him leads to trouble later on, he will be immediately in a position to substitute a new solution for the one discarded.

It has been the writer's experience with draftsmen and designers that they often speak of the *troubles* they meet in the design of a machine. This term should never be used. The only thing one can meet in the design of a machine is a problem. It is only when the designer tries to solve more than one problem at a time that he gets into *trouble*, but this trouble is of his own making.

While on the subject, which might almost be called the psychology of design, the writer cannot resist the temptation to mention the kind of idea, almost superstition, which seems to prevail that the ability to design a machine is a wonderful gift, the result of genius of some kind, and that the designer is fully entitled to the artistic temperament and all its attributes. There are a great many stories in circulation about designers who need a couch in their office because inspiration will not come unless they are in a horizontal position and supported by cushions of a certain degree of elasticity. Other stories tell of the designer who gets wan and thin from the intensity of his efforts; who for days is groping for the intangible idea which is constantly flitting around his head like a mosquito in summertime, but upon which he can no more lay hands than upon the aforesaid mosquito. Then, one night he wakes up from a deep sleep (generally about three o'clock, though the writer does not know why another hour would not do just as well), and he finds that his guardian angel

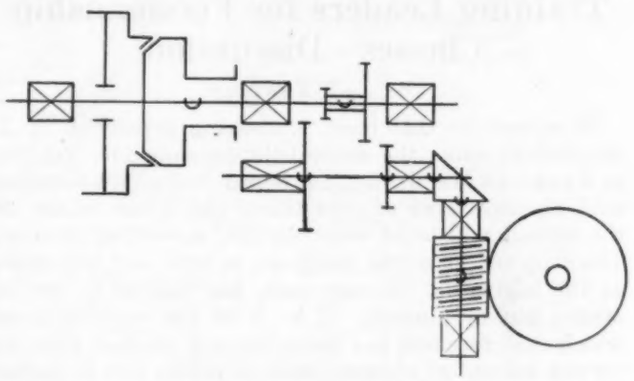


FIG. 3. A MECHANISM INDICATED BY SYMBOLS

has worked out the entire problem during his sleep and that all he has to do now is to sit down in his pajamas and put the thing on paper, after which the designer can once more give his attention to the now very necessary process of getting back to normal weight.

As a matter of fact, designing a machine is nothing else than a process of careful analysis and patient selection and checking of elements and devices with which the designer is supposed to be familiar. This is not an easy task, but neither does it call for gifts which a well-prepared engineer does not possess.

To a certain extent the preliminary analysis of a machine can be carried out without any drawings. In fact, drawings would be of no advantage as long as we have no clear idea of the construction of the units which we employ. It would not be possible, for instance, to represent a feed box by a drawing unless we have a very clear idea of the construction of that feed box. By and by, however, the analysis brings us closer to details, and it becomes necessary to find some way of representing our ideas on paper in some other way than by words. To make a complete drawing of a device when we know almost with certainty that we will modify it in every detail later on does not seem attractive. Drafting is a slow process, and the careful putting down of details of gears and shafts and clutches is not necessary until we have, and wish to preserve, all the dimensions and details of these elements. To overcome the necessity of making drawings which later

on will be annihilated, the author has been using for many years a set of symbols for various machine elements. One might call it a "drafting shorthand system."

In Fig. 2 are shown the symbols referred to. This, however, does not mean that somebody else could not use other symbols equally good and more in harmony with his personal taste. Fig. 3 shows an arrangement of a gear mechanism represented by means of these symbols. There is a pulley with friction clutch, the clutch being keyed to a shaft. To this same shaft is keyed a pair of sliding gears which can mesh with two stationary gears on another shaft; and to this second shaft is keyed a bevel gear, driving another bevel gear on a third shaft, on which is keyed a worm driving a worm wheel. It takes only a few minutes to draw up such a complete mechanism preparatory to analysis.

This matter will be taken up more in detail in the following chapters.

Training Leaders for Foremanship Classes—Discussion

By J. T. Towlson

In respect to that most interesting article by D. J. MacDonald under the above title, on page 249, Vol. 55, of American Machinist, it is hoped that what a foreman with an experience of over thirty years has to say on the subject will be of some service, as well as interest. The shop foreman, the ideal one, is born and not made, as the saying is. In any case, his making is not by others, but by himself. If he is of the material from which real foremen are made, he will possess just the correct amount of common sense to enable him to gather knowledge, both of men and of machines; while if he does not possess, or is not constituted of the right kind of material, no instruction will ever bring him up to within miles of the ideal foreman.

I have found that many briefs have been held, and rightly so too, on behalf of the rank and file of the men engaged in our engineering industries; and also that earnest and intelligent writers have penned lengthy dissertations, setting forth the difficulties, the responsibilities and the burdens of employers. But, as to the foreman—whether it has been supposed that a super mechanic who has dropped into a foremanship is so exceedingly fortunate as to be quite outside the pale of any possible reason for dissatisfaction, or whether it has been assumed that he is identified with a sufficiently intelligent and progressive class which is well able to assert its right—no one has seen the need of holding a brief for him. The number of writers who have assisted in adjusting his real or imaginary bearings are lamentably few, so the only thing to be done is to take up the cudgel for him.

There need be no hesitation in stating, for it is so well known, that his remuneration is small—too small, and besides this that he is a kind of "buffer state" between master and man. There is also a sad want of respect shown to him from those who have thought so well of his value and capabilities as to place him in charge of a hundred or so men and machines.

For the purpose of making it sufficiently clear to the reader the type of shop foreman referred to, it may at once be said that there are several classes, and of these three stand out distinctively.

Firstly, the real live man, who by insistent observation and study of men and machines, and who by a naturally quick and intelligent grasp of the elements that are calculated to build up the ideal foreman, and who by earnestness and solicitude to do right, all but succeeds in attaining the ideal.

Secondly, there is the man who, with less natural ability and talent, with lack of enthusiasm and grit, fails to reach a position or condition anywhere near that which should be the goal.

Thirdly, there is the foreman who has no natural ability, has wasted his time, neglected his books and possesses no enthusiasm and no ideal even as a mechanic. He has been "pitch-forked" into the position on account of his policemanship proclivities, or some other equally pernicious quality. He jogs along week by week, draws his pay and assumes no responsibility for work done. If a job is right, he did it; while if it is wrong, he had no hand in it. He puts up with all kinds of indignities without complaint, he possesses no pride as a mechanic or an engineer, and he depends entirely upon his men or his boss in all extra difficult jobs. He thus breaks on each and every day of his life every rule and law that tends to preserve the prestige and dignity of the foreman's position—a foreman only in name.

The foreman who is positioned in the first class of the foregoing category is in the first place a born mechanic, ultra practical, but with sufficient common sense to be aware that there is not that conflict between practice and theory that is commonly imagined by the ignorant. He is well read, in touch with modern ideas and has an all-abiding conscientiousness toward his employers, but none the less towards his men. Notwithstanding differences of pay, he considers himself the social equal of his better-paid associates; he is respectful to his managers, yet cannot be servile to any man.

Treatment of a Foreman

This ideal foreman expects to be treated as a gentleman, for such he is; he requires to be consulted in respect to changes in discipline and in the general control of his men and machines. He is ready and willing to co-operate and to second the wishes of his bosses, if he is so consulted.

It will, then, be readily understood that this kind of foreman will rightly deem that his dignity has been lowered and his prestige assailed if he is not treated in the proper manner. The absence of respect and trust will go far to render him dissatisfied, tending to cripple his valuable initiative, and crushing with loss to his employers his individuality. There may be times when he wishes himself back at his tools again. He is often paid at too low a rate, although he may be entrusted with the execution of costly work, the profit from which he is well able to make or to mar.

It would be well for Mr. MacDonald to direct his valuable efforts toward training teachers of managers, especially in the direction of enabling the managers to understand the shop foreman's mentality. He might show them the unprofitable effect of inflicting strict rules and regulations, and enable them to understand that man-to-man treatment of such vertebrates would be found infinitely more productive of profit, than a system which includes the papering of the shop walls with "Thou shalt nots" and dire penalties.

In closing my defense of my friends, the live shop foremen, with sincerity I state that employers would do well to make friends with their foremen, for certainly in that way lies success.

Machining the Peerless Crankshaft

Crankshaft for an Eight-Cylinder Motor—Double Connecting Rods Require Long Crankpin Bearings—Details of Oiling and Methods of Drilling Oil Holes

BY FRED H. COLVIN
Editor, AMERICAN MACHINIST

THE crankshaft of the Peerless eight-cylinder motor has four throws, a center bearing, and is counterweighted, as can be seen in Figs. 1 and 2. The pins are long enough to accommodate the connecting rods side by side, instead of rods of the interlocking or spade type. A good idea of the problems involved in machining this crankshaft can be had from Fig. 1, which shows the general dimensions as well as the design of the shaft, the location of the oil holes, etc. Where tolerances are not given, the practice of the Peerless company is to hold all dimensions given in fractions (except drill and commercial stock sizes) to come within plus or minus 0.010 in. Dimensions given in decimals but with no specified tolerance are to be within plus or minus 0.003 in. Where tolerances are given, they are, of course, to be followed.

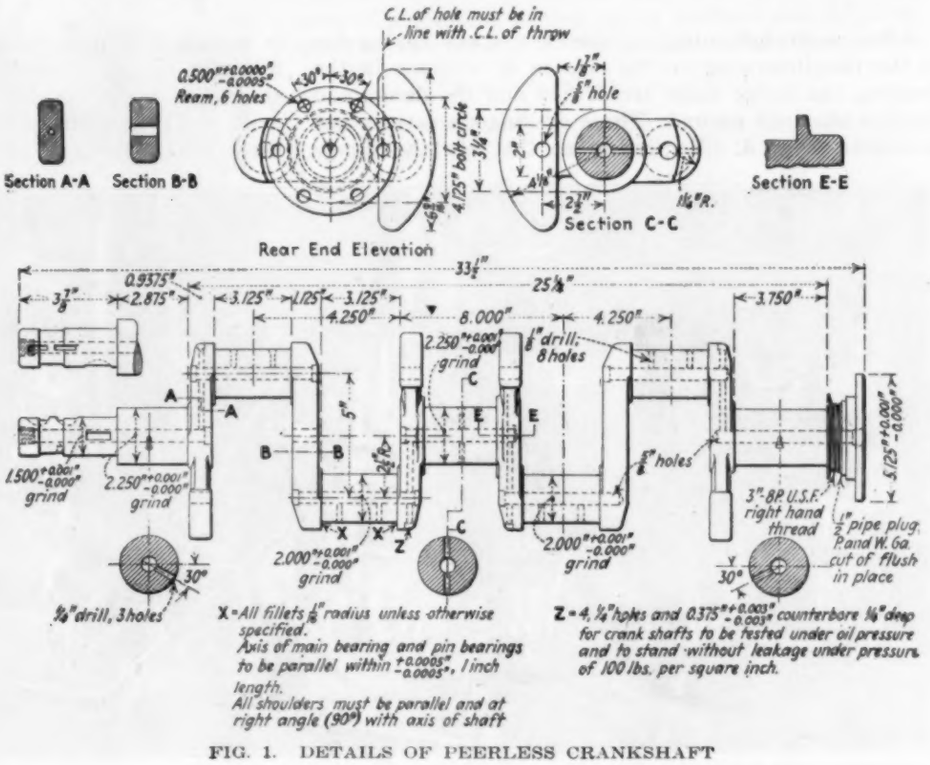

C.L. of hole must be in line with C.L. of throw
Section A-A
Section B-B
Rear End Elevation
Section C-C
Section E-E
X = All fillets 1/8" radius unless otherwise specified. Axis of main bearing and pin bearings to be parallel within +0.0005" -0.0005", 1 inch length. All shoulders must be parallel and at right angle (90°) with axis of shaft
Z = 4, 1/4" holes and 0.375" +0.003" -0.003" counterbore 1/8" deep for crank shafts to be tested under oil pressure and to stand without leakage under pressure of 100 lbs. per square inch.

FIG. 1. DETAILS OF PEERLESS CRANKSHAFT

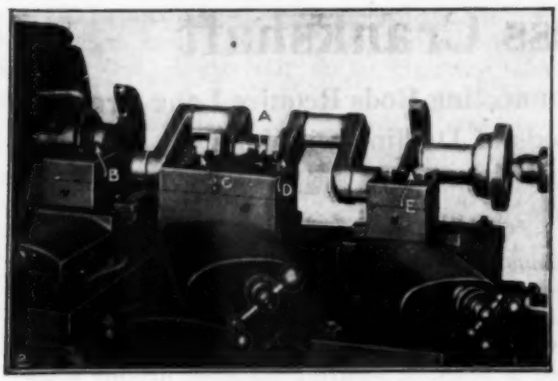
The oil distributing channels are divided into three sections, one being fed from each main bearing and one from the center bearing. The center bearing feeds the second and third crankpins while each of the end bearings supplies oil only to the pin next to it. It will be noted that each crankpin has two oil holes, these being located so as to come in the center of each connecting rod bearing. The thread at *A* is cut simply to aid in keeping all the oil drip possible within the crankcase. The thread tends to carry the oil to the beveled flange which comes inside the motor casing so that the oil finds its way down into the pan instead of to the clutch. The sequence of operations is:

Operation	1	Sandblast.
Operation	2	Straighten.
Operation	3	Rough-turn center bearings and counterweights.
Operation	4	Finish-turn center bearings.
Operation	5	Turn flange and rear line bearings.
Operation	6	Turn front bearing and gear fit.
Operation	7	Turn pin bearings.
Operation	8	Re-straighten.
Operation	9	Drill holes in flange end.
Operation	10	Drill, re-center and finish face.
Operation	11	Grind flange.
Operation	12	Grind line bearings.
Operation	13	Drill and ream flange holes.
Operation	14	Drill, ⅜-in. oil hole through pin bearing.
Operation	15	Drill ⅜-in. hole through line bearings and counterbore for plugs.
Operation	16	Grind pin bearings.
Operation	17	Finish-turn flange and thread.
Operation	18	Drill ⅜-in. oil holes.
Operation	19	Drill and counterbore ¼-in. holes.
Operation	20	Face to proper length.
Operation	21	Tap holes in end.
Operation	22	Mill keyways.
Operation	23	Balance.
Operation	24	Inspection.

The rough-turning of the center bearings and also the counterweights is done on a LeBlond lathe as shown in Fig. 2. The gear end of the shaft is held in the four-jawed chuck shown, although a bent tail dog is also used to assist in securing sufficient driving power. The tool for the bearing is held in the special toolblock at *A* and is adjustable from the back by the screw shown. Tools for turning the four counterweights are held at *B*, *C*, *D* and *E*. The center bearing is also finish-turned on a LeBlond lathe.

Two methods are used for turning the four crankpins. Fig. 3 shows a Wickes lathe which drives the crankshaft from both ends and turns two pins at once. Each toolhead carries a broad-faced tool as shown at *A* and *B*. Ample lubrication of the cutting tool is secured by means of the two pipes which carry the cutting lubricant directly on to the pin being turned.

The other method of turning pin bearings is shown in Fig. 4, in which a LeBlond lathe is used. The crankshaft is driven from both ends, the middle pins being turned in the position shown. This arrangement holds the crankshaft very firmly and tends to prevent spring while turning pins 2 and 3. The crankshafts are gripped by the web and also by the other pins, jaws *A* and *B* being used for this purpose. These same chucks can be used for turning pins 1 and 4. The cross-slides carry two sets of tools, one for turning the pins and the other for facing down the webs or cheeks.



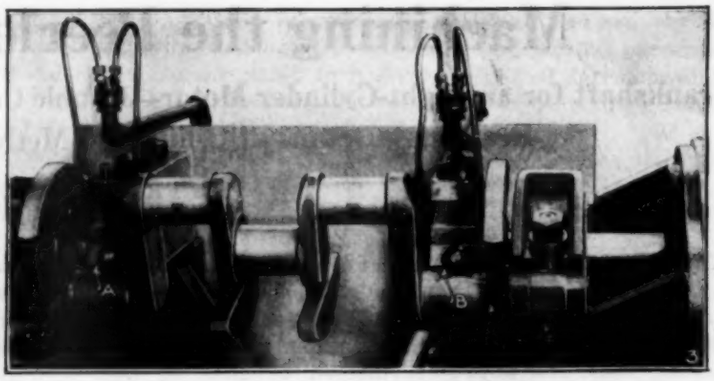


FIG. 2. ROUGH TURNING CENTER BEARING. FIG. 3. TURNING PIN BEARINGS ON WICKES LATHE

After re-straightening, to take care of any spring due to the rough-turning or the release of stresses in the forging, the flange holes are drilled and the flange and the line bearings ground. Three drilling operations are shown in Fig. 5. Beginning at the left the flange.

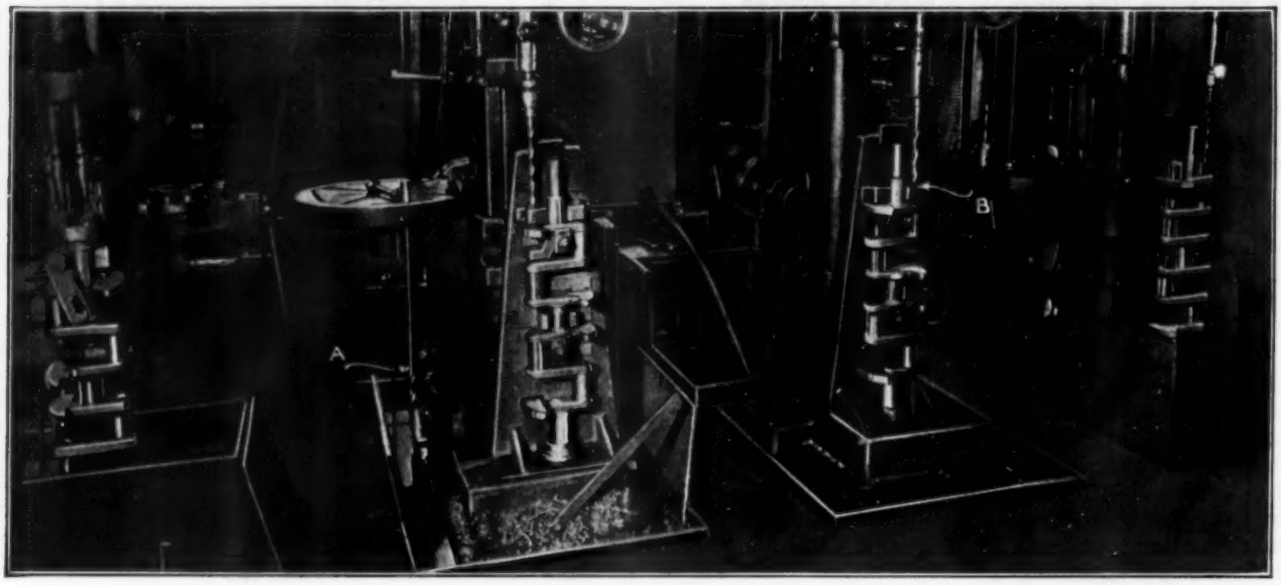
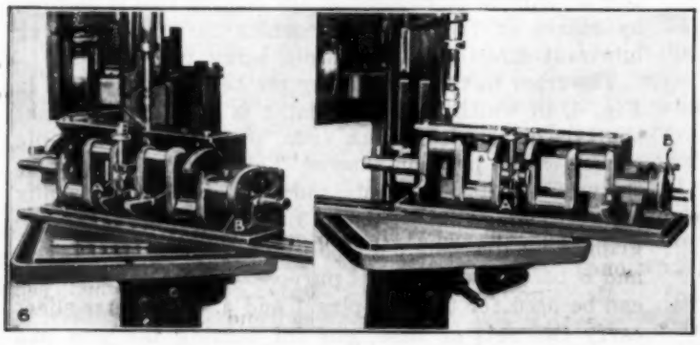


FIG. 5. DRILLING FLANGES AND OIL HOLES

holes are being drilled with a multiple-spindle head, while the other operations are the drilling of the oil holes through the bearings, as indicated in Fig. 1. These fixtures (Fig. 5) show how the crankshaft is held in position and how the drills are guided for the different drilling operations. It will be noted that it is necessary to drill through one of the counterweights in order to get at crankpins 2 and 3. The long drill shown at *A* reaches down through the second pin and drills the next without removing the shaft from the fixture. The drilling of the end crankpins is shown at *B*, in which the two counterweights are drilled through to avoid changing the crankshaft end for end.

The pin bearings are next ground, after which the connecting oil holes are drilled in the crank webs and the distributing oil holes drilled in the bearings, as in Fig. 6, which shows the method of holding the crank-



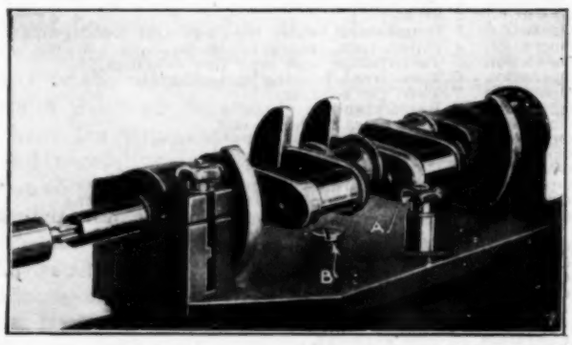


FIG. 6. DRILLING OIL PASSAGES AND DISTRIBUTING HOLES. FIG. 7. TAPPING THE ENDS

shaft, the central bearing being clamped as at *A* in both cases. The crankshaft is indexed by means of the flange holes as at *B*, and the outer end supported as shown. The same type of drilling fixture answers for both operations, making it unnecessary to transfer the crankshaft from one fixture to another. The drilling machines are conveniently placed so that the fixtures can be readily moved from one to the other.

The tapping of the holes in the end of the shaft is

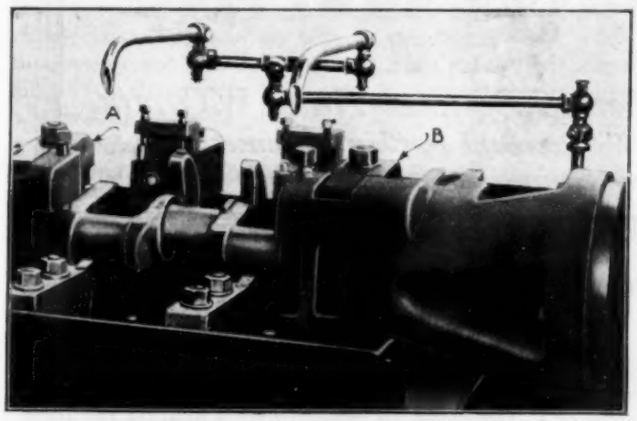


FIG. 4. TURNING PIN BEARINGS ON LEBLOND LATHE

done on an old lathe provided with the swiveling fixture as shown in Fig. 7. This fixture clamps the shaft by the end bearings as shown, the fixture being indexed by the pin *A* and swiveling on the stud *B*.

Saving Money in the Assembly Department

BY R. F. HELLER

In these days of economy and cutting down the costs of production the assembling department appears to be the one department where the greatest showing along these lines can be made. This is due to the assembling department usually being the largest, particularly in factories where minor machining operations to size are done in this department, and where the majority of operations are performed by hand. Opportunities to change from old methods to new are unlimited if the foreman is at all resourceful and such changes usually require little or no cost for new equipment.

To cite a particular instance, we have quite a number of close fitting jobs of studs and pins of all sorts on which the cost of grinding was prohibitive and we were at the mercy of the screw machine department as to quality. We pressed that department continually for better work until finally the foreman got an idea. He rigged up a still useful thread-rolling machine by grinding some obsolete threading dies smooth. He now rolls almost every stud and pin we use as smooth and round as one may wish, eliminating all the misery from the previous disagreeable fitting jobs, at less cost. Where very close fits of such pins and studs are required it is advisable to sort such work to size by a graduated taper gage, then it is easy to ream to fit.

Getting acquainted quickly with the various parts of a machine is the secret of success in assembling work, otherwise you work in the dark. In making changes great care must be taken to assign the proper grade of help to perform these operations under the new method so as to affect a full saving, as in most cases we contemplate changes with the idea of simplifying the operations in view. Under the old method it perhaps required three minutes for a skillful operator at the rate of 45 cents per hour to perform an operation. If under the new simplified method it required but two minutes for a 30-cent operator, it would be advisable to use the 30-cent operator and effect the full saving.

Great care must also be taken in setting new rates or time required to perform new operations. They must be set high enough to make it attractive to the operator to get full possible production. On the other hand, if set too high, besides the loss on the particular operation set wrong, it gives the operators a chance to make what they consider a day's pay too quickly and gives them time to idle away in gossip. In many cases this sows seeds of discontent among fellow workers and takes up the foreman's time in following up uncalled for troubles.

GIVE CREDIT FOR SUGGESTIONS

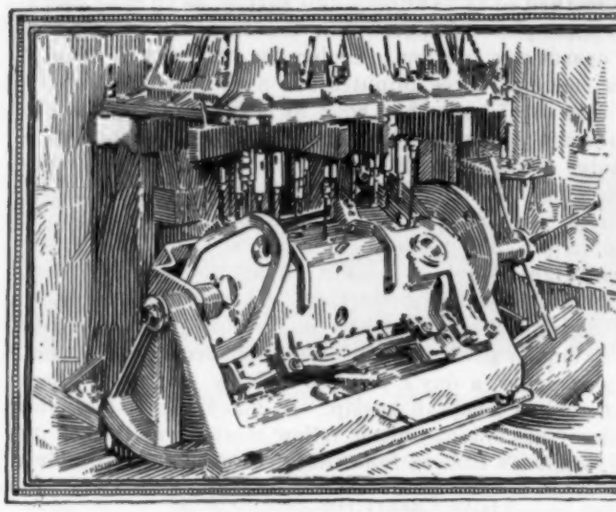
Many good suggestions can be derived from the operator by keeping in close touch with him, for he is thoroughly familiar with the operations he performs and if at all intelligent he is the most reliable source of information. It is well for a foreman when he receives such suggestions from his men, to mention who suggested them when he presents them to his superiors, as that will further encourage such suggestions from the men. The management in turn will give the foreman more credit than if he presented the suggestion to them, omitting to mention who in reality suggested it.

A foreman should never neglect to listen to kicks and complaints from operators about defective parts or material, though they may be put to him in a crude and most unbearable way. For, from such sources often come the best information as to further improvements. The best foreman is he who can listen to such complaints without his temper being the least affected. He can then bring these troubles to the attention of the proper sources and hammer continually until the trouble is removed. This affects a saving of scrap and of time in the assembling department, as this department is a source of information as to the quality of work produced in every other production department of the plant.

Scrap can be cut down considerably and time saved in sorting by having proper boxes to hold scrap and defective parts, each marked plainly, set at each operator's work place. The operator separates it as he finds it, and it also tends to make him more careful about scrapping anything he may be able to use, as he knows you are interested in what he scraps. These boxes should be collected at regular intervals.

In hiring green help it is usually customary to interview applicants as to their past experience and capability before placing them in positions they are fit for, as near as possible to your judgment. After presenting new help to a reliable operator or key man to break in, and seeing that he is fully equipped with necessary tools and material, it is always a good point to mention the fact of your conviction "That you feel sure he will do well" so that the new operator hears it. The new operator will appreciate that you expect him to make good and will seldom fail to come up to your expectations.

Make no promises that you cannot keep, but keep those that you do make. Give and demand a square deal. Be pleasant, never lose your temper and you cannot fail.



Tool Engineering

By
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President and Chief Engineer
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Engine and Turret Lathe Tools for Turning Spherical and Curved Surfaces—Internal and External Finishing—Generating and Forming Attachments

IN THE design of tools for turning spherical surfaces it is advisable, as far as possible, to generate the surface by swinging the tool on a radius of the required size. On small work of brass or of other materials of such a character that they can be readily formed, it is possible to obtain good results by the use of a formed tool carried either on the turret or the cross-slide. The method previously shown in Fig. 356 can be applied also to the forming of a spherical surface. It is an advantage to make tools self-contained so far as possible, and thus allow other tools to be used in the turret or cross-slide in the same setting of the work.

In Fig. 366 is shown a simple form of spherical turning device for the work *B*. The body of the tool *C* is fastened to the turret, and is U-shaped so that it receives a swivel member *D*. This member carries a tool *E* held in place by two setscrews *F*. The swivel is pivoted at *G* in the body of the holder. The upper portion is attached to a stem *H* in such a way that it can be readily turned by moving the handle *K*. The stem *H* is fitted with a stop pin *L* which comes to rest against the stud *M*, thus limiting the movement of the tool.

In operation, the workman feeds the tool by hand by grasping the handle *K*, thus generating the surface. Tools of this sort can often be used for small work; but it is important that they should be used as close to the end of the spindle as possible, in order that the work does not have too much overhang and thus cause vibration. Particular attention must be paid in the design to the rigidity of the tool, as no support is provided.

When a forming plate is used for controlling the shape of a curved surface, a very simple arrangement can often be made. An example of this sort is shown in Fig. 367, where the work *A* has the projecting end rounded as shown. This operation does not require a particularly accurate job, yet the stock must be removed and a smooth surface machined. The bracket *B* is attached to the ways of the lathe and carries a forming plate *C* as shown. The cross-slide is fitted with a toolblock *D* in which the tool *E* is carried. Adjustment is made by means of the setscrew at *F*. At one end of the block the roll holder *G* is fastened in such a position that the roll *H* comes in contact with the form plate.

In operating the device, pressure is applied either by weight or springs in the direction indicated by the arrow at *K*, thus holding the roll firmly against the form plate. The crossfeed screw feeds the tool across the end of the work, and the direction of travel is controlled by the contact of the roll with the plate. A very simple device somewhat cheaper than the attachment can be made by using a form plate carried directly in the tailstock of the lathe. This does not require a special bracket *B*, and it can be made up somewhat more cheaply.

Inside Generating Tool

Considerable ingenuity is often needed in designing a tool for boring an inside curved surface. A simple device for this purpose is illustrated in Fig. 368. The work parts *A* and *B* are fastened together so that the two pieces are bored at the same time. The body of the toolholder *C* is held on the cross-slide of the lathe by a simple bracket. The forward end of the bar is piloted at *D* in the work. A slot is cut entirely across the bar at *E*, and in this slot a swivel member *F* is carried. The tool *G* is inserted in the swivel member and held in place by two setscrews, as shown. One end of the swivel block is cut in pinion form as indicated at *H*.

The side of the bar *K* has a rack cut upon it which

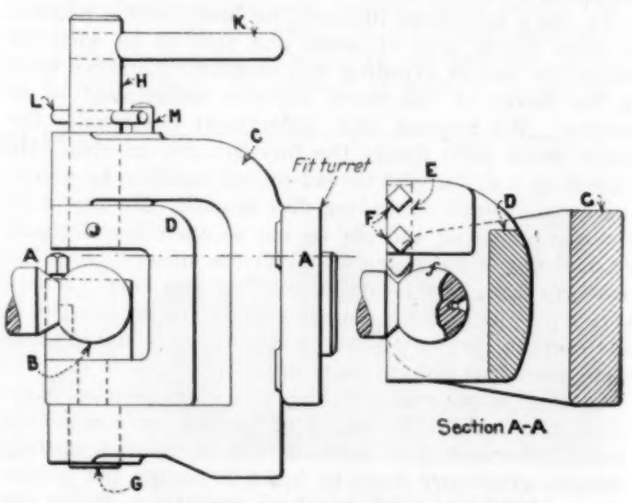


FIG. 366. SPHERICAL TURNING DEVICE

For the authors' forthcoming book. All rights reserved.

engages with the pinion *H*. The end of the bar *L* enters the hole at the end of the holder, thus giving additional support. The bar *K* extends entirely through the holder *C*, and is furnished with a stiff coil spring at *M* acting against the collar *N*. In operating the device, the cross-slide is moved into position and locked; after which the tailstock is screwed up against the end of the collar *N* and the feed is obtained by movement of the tailstock screw.

In Fig. 369 is illustrated a device used for turning the spherical surface *C* on the work *A*, which is held in chuck jaws *B*. The surface is generated by a radial movement and not by a form in this case. The cross-slide *D* is fitted with a bracket *E* on which is mounted a swiveling member pivoted at *L*. This swivel contains a toolholder *G* in which the tool *F* is adjustably held. The member *H* is fastened to the turret face and connected with the link *K* fastened to the swivel. The forward movement of the turret causes the tool to

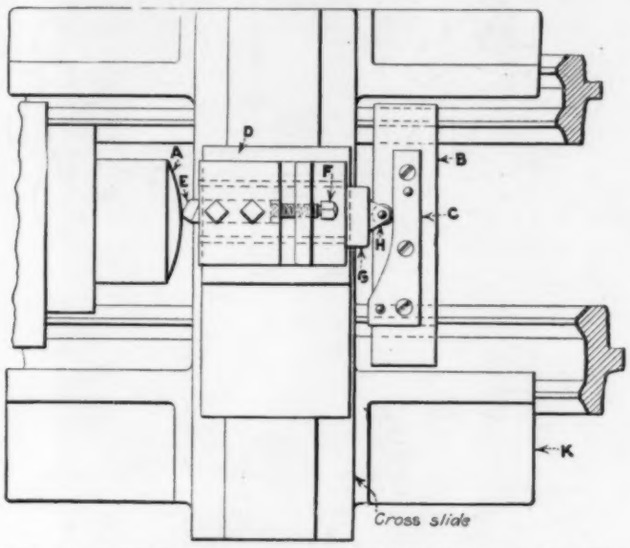


FIG. 367. DEVICE FOR ROUNDING THE END OF A CASTING

travel in an arc of the desired radius, so that the curved surface is produced by a true generating action.

Care must be taken in designing tools of this sort to make sure that the swiveling member is well supported and gibbed, so that there will be no lost motion or vibration. In the case shown, the swivel is turned circular at *M* and is held down by means of a circular strap *N*, which is fitted carefully so that there is no looseness. If required for a large diameter, it may sometimes be necessary to design a special cross-slide to hold the turning tools, in order that sufficient support for the swivel member may be obtained. The designer should be very careful to lay out the extreme movements of the swivel in both directions, to make sure that there are no interferences.

Spherical Turning Attachment

There are numerous cases in which a simple attachment can be made for an engine lathe to turn a spherical surface, such as that shown at *A* in Fig. 370. The work in this case is held on an arbor *B* driven by a special dog *C* in a slot in the faceplate. The outer end of the arbor is supported by a center in the tailstock *D*. The ordinary positions of the carriage and tailstock are reversed when using this fixture, as the tailstock is placed between the carriage and the headstock.

A special bracket *F* is fastened to the ways of the machine directly under the work, and on this bracket a swiveling member *G* is mounted. This member car-

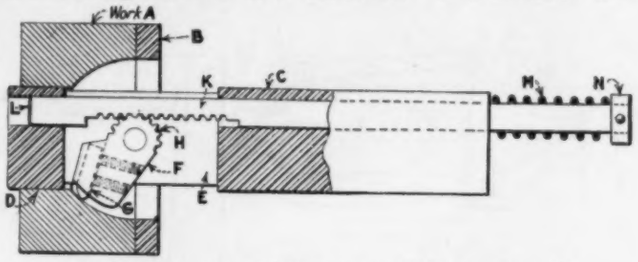


FIG. 368. INSIDE SPHERICAL GENERATING TOOL

ries a toolblock *H* in which the tool *K* is supported. The toolblock *H* is so arranged that it can be adjusted readily toward the center pivot *N*, so that various diameters can be turned. The carriage *E* has a block *L* fastened to it and connected to the link *M*, the other end of which is attached to the swiveling block *G*. It is only necessary to set up the work in the desired position and use the longitudinal carriage feed in the regular way. The tool *K* then travels on the circumference of a circle, the size of which depends upon the distance the tool is set from the center.

The operation of this device is very simple and the design is economical with regard to construction cost. In the example shown, the tool *K* is at the rear of the lathe so that there is a lifting cut upon the swivel. It would probably be better to arrange it so the tool is at the front of the lathe, as the pressure of the cut would then be downward instead of upward. The general details of the arrangement would be the same in either case.

Combined Curved and Straight Turning

It is rather difficult to turn a given diameter so that it becomes perfectly tangent to a curved surface on the same piece of work. In the example shown in Fig. 371, the end of the work is turned to a radius *A* which becomes tangent to the outside diameter and forms a

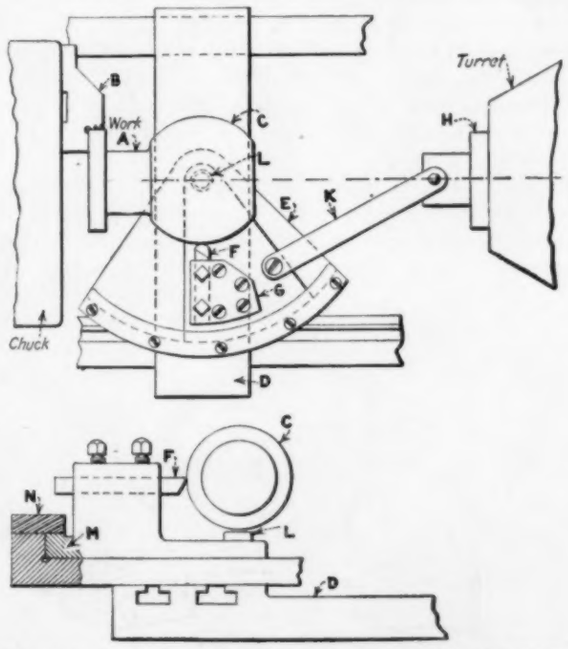


FIG. 369. CURVED GENERATING ATTACHMENT FOR TURRET LATHE

continuation of it. In order to make sure that there would be no interruption or shoulders on the work, it was decided to develop an attachment in which the same

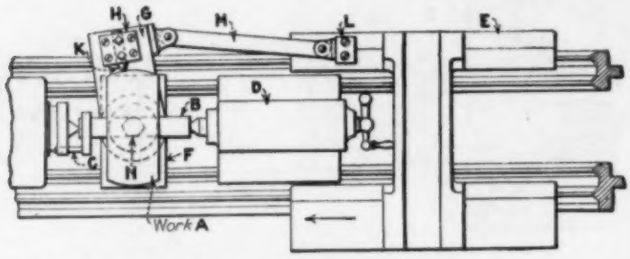


FIG. 370. SPHERICAL TURNING ATTACHMENT FOR ENGINE LATHE

tool would cut the radius and turn the outside diameter.

The work is held on centers in an engine lathe, and the regular cross-slide is removed from the carriage. A special bracket *B* is bolted to the back of the carriage, as shown, and in this bracket a dovetailed member *C* is fitted so that it will slide freely in a longitudinal direction. A link *D* of the proper radius is pivoted at *E* on the sliding member. The other end *G* is pinned to the block *F*, which is attached to a special toolslide *K* fitted to the dovetail on the carriage. This toolslide carries a turning tool *H* held in place by setscrews and furnished with a backing-up screw for fine adjustment. The latter is not shown in the illustration.

The block *L* is fastened to the sliding member *C* in such a position that the shoulder *M* acts as a stop against the radius bar *D* at the completion of the radius-turning movement. The rod *N* is fastened to the end of the slide *C*, and passes through a bracket *R* which is securely fixed on the ways of the lathe. The spring *P* thrusts against the collar *Q* pinned to the shaft, which latter is a sliding fit at *O* in the bracket mentioned.

In operating the device, the carriage is fed in the direction indicated by the arrow at *S*, and the radius rod remains in contact with the stop *M* while work is being turned cylindrical. When the collar *T* strikes the edge of the bracket *R*, the cylindrical turning operation ceases and the radius turning starts. It is evident that the movement of the member *C* is arrested at this point, so that the motion of the slide is controlled by the longitudinal feed of the carriage and the tool *H* travels about a center as constrained by the bar *D*, thus completing the work.

In generating a radius on the inside of a piece of work, the tools used for the purpose are affected very largely by the size of the work and the accuracy required. When a condition like this is found, great

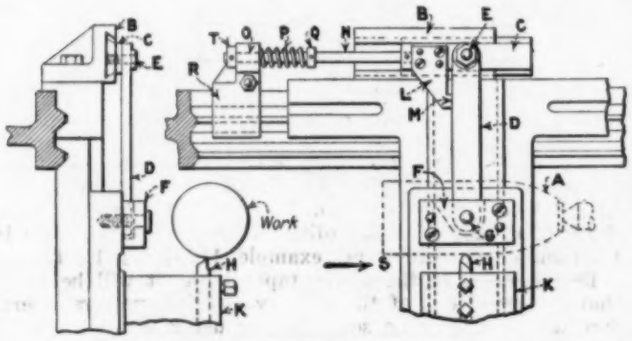


FIG. 371. COMBINED CURVED AND STRAIGHT TURNING ATTACHMENT

care must be taken in the design of a generating tool to make sure that it has sufficient rigidity to withstand the pressure of the cut. A support for the end of the bar in which the generating attachment is contained is of great importance.

In Fig. 372 is shown a piece of work *A* held in chuck jaws *B* on a turret lathe. The inside curved surface is to be generated to a true spherical form. The chuck is furnished with a bushing *C* which acts as a support for the bar *E* held in a bracket *D* on the face of the turret. The end of the bar *F* enters the bushing, and a collar *G* comes against the face of the bushing and acts as a longitudinal stop, thus positioning the bar.

The boring tool *K* is held in a swivel block *H* in a slot in the bar. It is pivoted at *P*, and a link *L* connects the swivel member with the sliding block *M* which is fitted to a longitudinal slot in the bar. The link *N* connects the bracket *D* with the sliding block mentioned, so that

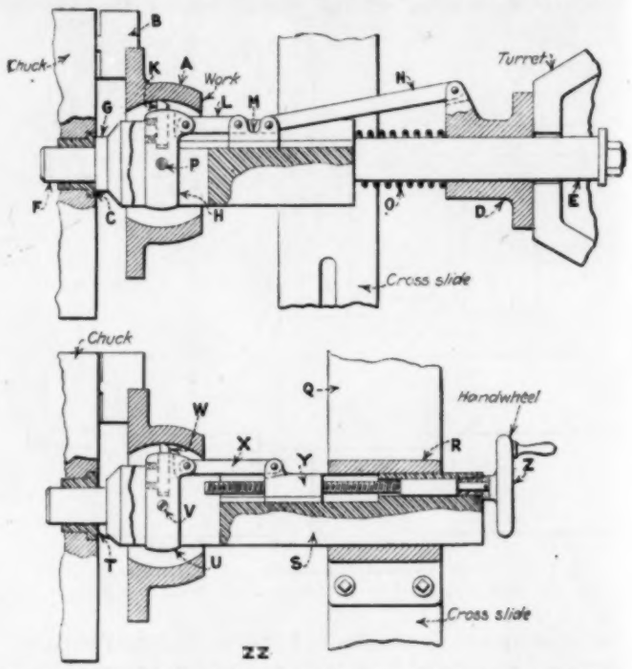


FIG. 372. TWO METHODS OF BORING AN INSIDE CURVED SURFACE

the tool can be fed. A heavy coil spring *O* is placed between the shoulder of the bar and the end of the hub on the bracket *D*. This spring keeps the thrust washer *G* up against the face of the bushing *C* at all times. In operation, the turret is moved forward until the tool is in position ready to start the cut, after which the feed is engaged. The turret then travels forward, carrying with it the bracket *D*, pushing the link *N* along, and thus causing the tool *K* to describe the proper radius.

A somewhat similar arrangement for the same piece of work is shown at *ZZ*. This application, however, is made to an engine lathe. The cross-slide *Q*, has mounted upon it a holder *R*, into which the bar *S* is clamped. The end of the bar is piloted in a bushing at *T*, but no stop collar is used. A swivel block *U* is provided with a pivot at *V* and contains the tool *W* which does the boring. This block is connected by means of a link *X* to the block *Y*, which is tapped to receive a threaded rod connected to the handwheel *Z*. By operating this handwheel, the block *Y* travels in the slot to which it is fitted, thus moving the link *X* and causing the tool to travel in the desired direction.

Shall We Standardize Tapers?

THE following paragraphs conclude the expressions of opinion on the merits of various tapers. These statements are given with a view to crystallizing sentiment in favor of one particular type, suitable to all branches of the machine-tool industry. The first and second parts of the articles were published April 13, and April 20, respectively.

No. 40. It would seem to us that with the thousands, and even hundreds of thousands of machines and items already arranged for the tapers already in existence, the Morse more especially (with the exception of perhaps certain milling machines), that the change along the lines you suggest would be very confusing and expensive for all concerned, and we should question the advisability of considering any change. In our case, we probably do not have more than a dozen orders in a year for a taper differing from our regular Morse taper, and they are generally for the Brown & Sharpe taper. We think the same rule would apply to the Brown & Sharpe people in any application that might come to them to fit their machines differing from their own taper.

We should think it would be a very serious matter to consider after so many years of having an established taper, such as the Morse taper, to consider making any change. From our own standpoint you can understand it would be a very serious matter for us to consider, and we should hesitate about doing so.

No. 41. Inasmuch as there are several good standards, the most popular of which are probably Brown & Sharpe and the Morse, the bringing about of a single standard for tapers would naturally meet with opposition from some manufacturers and the many users who might feel that a single standard would cause them some inconvenience and expense. Most of the specifications received by us are for the Morse standard, although there are some for the Brown & Sharpe.

We shall be glad to co-operate with whatever policies the engineering societies may decide upon. At any rate, we wish you success and regardless of opposition, we feel that you are making a step in the right direction.

No. 42. The question brought up in your letter is one that we, too, would like very much to see settled, and we think there is no time like the present for accomplishing the standardization of tapers. We would say by all means the Morse taper, and would like very much to see all machine tool builders adopt it as a standard. In this same connection we might state that we have been trying to get tap manufacturers to standardize on the diameter of their taps for the past three years, but have been unsuccessful, and it is therefore necessary for us to make a different size collet for each different make of hand taps and for each size of tap that is made. We would welcome any standardization of these diameters by the various tap manufacturers.

No. 43. Our use of tapers is quite limited and practically confined to the purchase of tools with them. It would be a convenience, of course, to have one standard for many uses and we would welcome such uniformity.

No. 44. We can readily understand your purpose in raising this question, although it seems to us to be somewhat late in the day to standardize on tapers. If it was decided that a taper different from the one we now use should be adopted as standard, it would cause us no end of trouble. We have 10,000 machines out using the taper that we have considered as standard. To change over all new machines to another taper, and have two different types of tapers, requiring two different sets of spindles for repairs, would lead to considerable difficulty and confusion. Should we on occasions send the wrong taper, considerable expense would have to be incurred, as our men would be obliged to go to the customer's plant and straighten the trouble out.

If the taper in the spindle of our headstock does not happen to fit, a demonstrator may have to travel several hundred miles to help the customer decide why it does not fit.

We make a taper hole in the headstock and footstock spindles because we want to have a certain condition of proper fit and support for the centers of these two heads. A Jarno taper has been selected because the formula determining the size of the taper is an easy one to remember and follow, and because it has just the right amount of taper to make the centers fit with the proper degree of tightness.

No. 45. This company has for many years used and advocated the Jarno taper for the spindles of both milling machines and lathes. We have believed, and still believe, that the Jarno taper is by far the most desirable among those commonly used as standard.

However, we recognize the desirability of uniformity of practice among manufacturers, and for the sake of uniformity we would be willing to consider the adoption of other standard tapers. In fact, we are already equipping some of our milling machine spindles with Brown & Sharpe tapers and are seriously considering the matter of equipping some of our lathe spindles with Morse tapers.

No. 46. There can hardly be a doubt as to the Morse taper being best for machine tool use. Nearly, if not all small tools, drills, etc., have the Morse taper—it drives out easier. We feel sure that Morse is "IT" and we would sure like to see it made standard.

No. 47. We believe a standard taper for machine tools would be a very good thing. We have always used the Morse system and it is standard for all drilling machines so far as we know. Regarding the other systems we have not used them enough to be able to intelligently discuss them.

Uses Jarno, and Modifications

No. 48. At the present time there is considerable controversy and difference of opinion, in our own organization, as to the proper standard taper to be used in engine lathe spindles, the question being whether we should finally standardize on Morse tapers or a modified Jarno.

We are all fully conversant with the fact that Morse tapers are used in vertical drilling machines, this being the standard adopted, and that in general a standard has also been adopted for milling machines. The fact remains, however, that there are various types of tapers used in engine lathes and it seems to be the opinion of some that it would be much better to adopt a taper which does not conform to the taper of drill shanks, thereby positively eliminating the possibility of using our tailstocks for drilling purposes.

Every good mechanic appreciates the fact that the tapers of the head and tail spindles are very essential parts of the machine and should not by any chance be bruised or abused in any way by inserting shanks with tangs similar to those used on drills. However, in order to use a Jarno taper we have considered modifying the length, as there is no doubt that the general feeling exists that the Jarno taper is rather long.

We therefore have considered using a Jarno taper with the formula: No. of taper $= D$ (large diam.) $+ 8$; length $= 2\,D + 1.75$ in.; small end $= D - 0.05\,L$, with the hole relieved $\frac{1}{2}$ in. back of the taper. Where the customer insists on using a Morse or Brown & Sharpe taper a sleeve may be furnished having a modified Jarno taper on the outside and a Morse or Brown & Sharpe taper on the inside.

There is a still further advantage in using a modified Jarno taper in that the practice today calls for large holes through the head spindle, which by investigation, shows that they vary according to the size of the lathe in fractions of an inch, as per example, $1\frac{1}{4}$, $1\frac{3}{8}$, $1\frac{1}{2}$, $1\frac{5}{8}$, $1\frac{3}{4}$, etc.

By referring to the Morse taper table, it will be noted that the small end of the taper varies by quarters, therefore it will readily be seen that by using Morse tapers it becomes necessary to use adapters which introduce a second joint or fitting, or to lose approximately one-half the

length of the bearing on the taper should they eliminate the adapter. By using the modified Jarno, the small end will vary in diameter according to the size in approximately one-eighth of an inch, and, therefore, lends itself admirably to the work.

We would certainly appreciate having a standard established and we can see no reason why such a standard should not be adopted by all lathe builders throughout the country.

No. 49. We feel that it would be almost as bad a proposition to change our standard—namely, Morse taper to either the Jarno or Brown & Sharpe, as it would be to change our system of measurement to metric. While it could probably be done, if spread over a long period of time, we feel that without question, our customers would be to a great extent still asking us to manufacture machines with the present standards. This would be on account of the fact that they have thousands of dollars tied up not only in drills but special tools, collets and chucks. To attempt to change, or to attempt to use several different tapers, would cause confusion and would add complication to an already complicated system. Without doubt, it would be ideal for a new plant to be able to interchange arbors, drills, chucks, etc., between milling machines, lathes and drilling machines. It would, however, be a hardship to ask plants already established to carry the additional equipment necessary until their present equipment has become obsolete, which—in many instances—might prove to be thirty or forty years.

A Study of Tapers

No. 50. We are of the opinion that none of the existing tapers are correct in theory and design and that none of them should be adopted as a standard taper for machine tool builders. We feel that there should be two standard tapers; that a taper ⅝ in. per foot should be adopted for drills, and drill presses; and a taper of ½ in. per foot for all milling machines and milling machine tools. Then, too, the taper shanks now in use are much longer than necessary. The lengths of the tapers were designed at a period when taper holes were finished by hand; now, however, taper holes, as well as taper shanks, are ground to size. The resulting fit is as perfect, theoretically at least, as human ingenuity can make it. In our opinion taper shanks two-thirds of their present length would be sufficient. This is particularly true of the larger size of tapers.

To be more specific, the Brown & Sharpe tapers, if made with a taper of 0.500 in. per foot, might be adopted for all milling operations with the exception that the No. 6 and No. 8 tapers could be entirely eliminated as they are seldom used. There also is no practical reason for having two No. 9 tapers and two No. 10 tapers. As to the lengths for these tapers we would suggest the following:

Nos. 1 to No. 5 could be adopted as they are; No. 7 should be 2½ in. in length; No. 9 should be 3 in. in length; No. 10 should be 3½ in. in length; No. 11 should be 4 in. in length; all sizes above No. 12 should be 4½ in. in length.

The Morse tapers, if made uniformly 0.625 in. to the foot, might be adopted for all drill operations with the exception that the lengths should be as follows:

No. 0, 1⅛ in. long; No. 1, 1⅝ in. long; No. 2, 2 in. long; No. 3, 2½ in. long; No. 4, 3 in long; No. 5, 3½ in. long; No. 6 and larger, 4 in. long.

While firmly believing that the adoption of some one standard would be most beneficial to the machine builders, as well as to the users, we are of the opinion that it will be impossible to accomplish anything in this direction. An attempt to adopt a standard along the above or similar lines, would in our opinion result in adding another system of tapers to those already existing, but would not supplant any of them. Even if some one system could be devised that would meet with the approval of all machine tool builders, it would require a long period of years and constant striving to secure the universal adoption of the system.

Wants Standard Spindle Noses Too

No. 51. Our superintendent suggests that all Morse tapers should be ⅝ in. to the foot instead of random tapers, as is the case at present with the different size tapers. All Brown & Sharpe tapers should be ½ in. to the foot if both tapers are to be retained. If a single standard is to be adopted, that standard should be either one of the above, or one of about ⅞ to the foot. It would simplify matters considerably if one standard taper were to be used.

Another thing to which you may call attention in the manufacture of machine tools is the standardization of certain threads and parts for different machines. For instance on the spindle nose of a lathe or a milling machine, a certain standard should be maintained for each size lathe so that the purchaser of lathes could use the same chuck on all 16-in. lathes, and the same chuck on all the 20-in., etc. At the present time every manufacturer places his own idea of the number of threads to the inch on the nose of the spindle of both the lathe and the milling machine, and consequently the purchaser of the machine must have a large supply of chucks on hand to fit all different makes of lathes.

No. 52. As an engineer the problem that presents itself is to standardize, if possible, upon one kind of taper. From the standpoint of the shop the problem is to utilize all of the tools and equipment which they now have. This shop uses both Brown & Sharpe and Morse tapers. We have no machines with the Jarno taper. The latter is very convenient because of the ease with which it may be figured, but from practical experience its limited application to various machine tools, in so far as this shop is concerned, would suggest its entire elimination.

As to the other two tapers, the Morse so far predominates in numbers over the Brown & Sharpe that I would suggest it be used exclusively, if either of the two are to be made the standard. This, of course, is merely the reflection of the practice of one shop. Practically, I question seriously whether any change could be made for a considerable number of years in any shop, but I do feel that new equipment using one or the other of the two tapers would help in the long run in the matter of economy in production in this country.

Jarno Seems Best, But—

No. 53. Undoubtedly, the Jarno taper has advantages which do not appear in the others and we should say of the three mentioned that this one would be the best if we could have but one. We have, however, so much machinery and so many small tools tied up to the other two systems that it looks like a rather hopeless task to attempt to make any very radical change. We will be satisfied to use Brown & Sharpe tapers for our milling tools and Morse tapers on our drill presses, although it would be very nice if the drills could be used in the milling machines and, occasionally, if an end mill could be inserted in a drill press, which would be the case if the same taper were used for everything.

If a standard is to be gradually adopted, it looks as if the Jarno would be the best thing to aim for, although we cannot just now see where it will be able to get a substantial foothold which will be necessary before it can compete with either of the other two as a universal standard.

No. 54. In connection with our line of drilling machines, we furnish spindles with No. 2 Morse taper hole and do not recall ever having a request for machines with any other taper. For milling machines, we have adopted a Brown & Sharpe taper for the hole in the spindle and this has been generally satisfactory.

There is no doubt, however, that the adoption of a standard taper would have a great many advantages. Just what this taper should be, however, should be decided by wiser heads than ours.

No. 55. I feel it is extremely unfortunate that various tapers should be employed in the production of machine tools, and on the face of it, it would seem to me that there would be no reason why a standard taper could not have been utilized in place of the various tapers which are now employed. The Jarno taper appeals to me as being the most simplified type of taper that could be employed, and if we should at any time develop a line of grinding machines, you can rest assured that the Jarno taper will be the one used in our designs.

No. 56. We are using more of the Morse tapers than the

Brown & Sharpe or Jarno. As a matter of choice, we favor Morse only because it seems to be more universal in our shop. We are in hearty accord with the adoption of a single standard in this connection because of the expense and trouble found in maintaining two or three tapers in the shop.

Generally Ends in Discussion

No. 57. This question has been discussed many times, and it generally ends there. We have frequently been applied to on the subject of drill shank tapers, and have stated our own practice. We decided, probably in the sixties or earlier, that the ⅝-in. taper per foot was too small for satisfactory use on account of its tendency to wedge. A taper of ⅝ in. per foot was found to be better, and we adopted it for lathe centers and drills. We also found that driving by a tang on the small end of the shank was very unsatisfactory and that tangs were frequently broken off, thus ruining the drill. We therefore adopted the plan of keyseating drill shanks and provided drill chucks with a long parallel key or spline for driving. This construction has proved to be eminently satisfactory. We never break a shank. While many people have conceded the superiority of our standard, comparatively few use it, and drills thus made cannot be obtained from stock.

No. 58. We agree with you that it is emphatically important that we should have a single standard. The Morse taper seems to be very satisfactory for drills, and as that taper has been in existence a long time, we do not see any reason why the same taper could not be used in lathe spindle and other machine tools where a taper in the spindle is required.

A number of years ago the writer was appointed as a committee of one to look up and endeavor to standardize electric motors for machine tools. His correspondence with the various manufacturers of electric motors was very interesting. Each manufacturer acknowledged that it would be an excellent idea to have electric motors standardized, but each manufacturer wanted all the other manufacturers to come to his standard. We hope that the standardization of tapers for spindles may be brought about.

Romances of Metal Working—The Legend of Rudolph of Nuernberg

By H. H. Manchester

The tradition of Rudolf of Nuernberg was narrated by Conrad Celtes in his description of the city of Nuernberg, about 1491.

From this story Rudolf of Nuernberg was long considered the inventor of wire drawing in the 14th century, but we know that the invention had been made several centuries before. As a matter of fact, the story itself emphasizes his work as involving great improvements, rather than the original invention. The legend may be retold as follows:

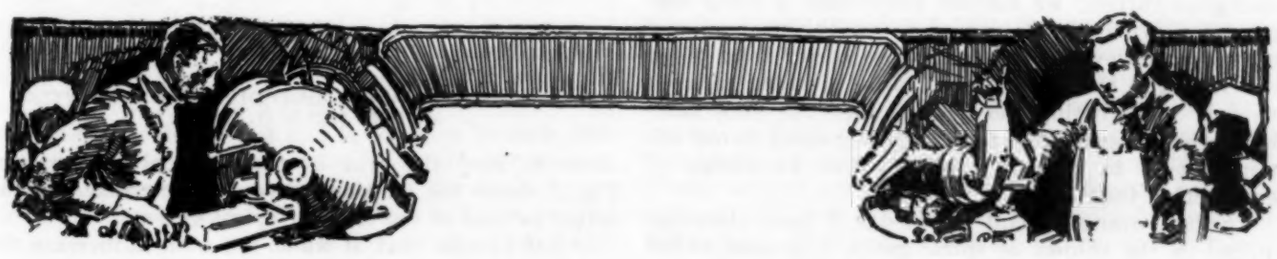
Rudolf and his son were wire drawers in Nuernberg in the 14th century. At that time there was a great demand for heavy iron wire to be used in chain armor, and for fine wire to be used in winding with yarn for purposes of embroidery. In those days the process of making wire was either the ancient one of cutting a thin strip of metal and hammering it round, or else of drawing the wire through the steel draw plate by main strength with the aid of pincers to grasp the wire, and perhaps a swinging seat to allow a longer and easier pull. Of course, this was hard work, and Rudolf discovered that it could be lightened by the use of wheels. Whether this was the winding of a wire on a drum, as it was represented in pictures early in the 15th century, or whether Rudolf actually discovered how to apply water power to wire drawing, which is not represented in pictures for another century, is uncertain, but the greater likelihood is that his improvement was the use of drums for winding the wire through the draw plate.

At all events, his process was so much easier and faster that he soon acquired considerable wealth. He

WIRE DRAWING IN OLDEN TIMES

tried to keep his process secret, and was in a measure successful, but he could not disguise his growing prosperity. As a consequence, the other members of the guild began to suspect that he was concealing craft secrets from them, and getting hold of his son succeeded in so wheedling and bribing him that he eventually disclosed the entire secret.

This so enraged Rudolf that he flew at his son in an attempt to kill him, but he managed to escape into exile, the outcome of which was to extend the knowledge of wire drawing still further.



A Chart to Aid the Figuring of Helical Gears

Relation Between the Elements of Helical Gears—Method of Constructing the "Spiral' Gear Protractor—More Rapid Solution of Problems in Helical Gearing

By W. C. STEUART

Chief Engineer, Detrick & Harvey Plant, Bethlehem Steel Co.

I AM GOING to call them spiral, instead of helical gears for the same reason that most people say "aren't" or "ain't" for "are not"; I do not want to appear priggish. I shall call them "Spiral Gears," for that is the term which most of us use.

When I was a cub draftsman, some eighteen or nineteen years ago, spiral gears were regarded among us

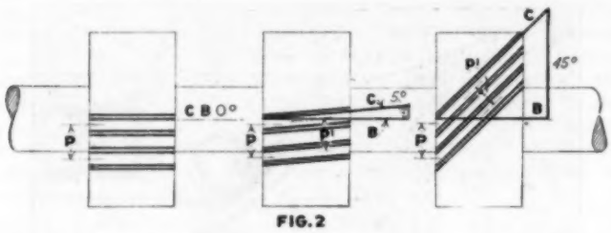


FIG. 2

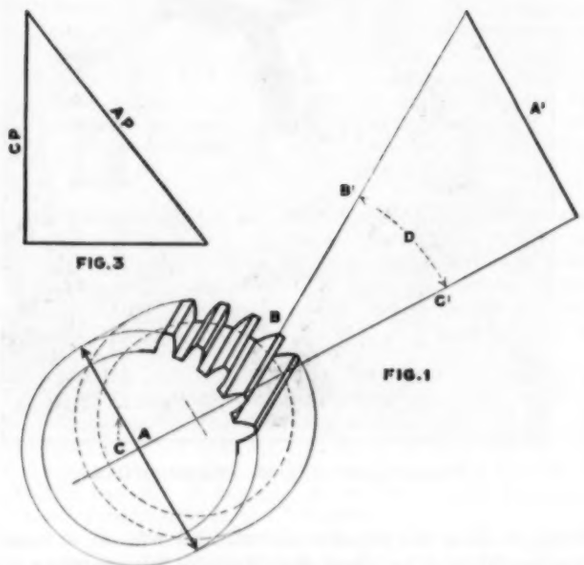


FIG. 3

FIG. 1

FIG. 1. ELEMENTS OF A HELICAL GEAR. FIG. 2. COMPARISON OF SPUR AND HELICAL GEARS. FIG. 3. RELATION BETWEEN PITCHES

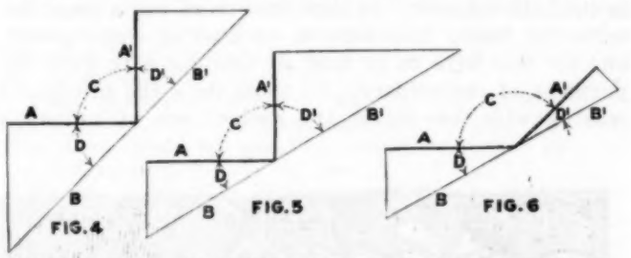
as a sort of dark and bloody mystery. Even the "Chief" himself did not know how to figure them, and if a pair of spiral gears were wanted to fit into the design of a machine, we would send the center dimensions, clearances, etc., to some gear manufacturer who would design a pair of gears to suit and send us a special cutter for cutting them. As for cutting them with standard spur-gear cutters, we did not know such a thing was possible. We have all learned a few things since our cub days, however, besides knowing better than to go out into the shop to borrow "a left-handed monkey wrench" or a "lifting and striking tool" for some baldheaded and bespectacled senior who appeared to our admiring eyes to have a more profound knowledge of engineering than Professor Sweet.

The not over-abundant knowledge I have since acquired on the subject of spiral gears, I propose to set forth in this article, together with a description of a spiral-gear protractor which any draftsman may make for himself, and which he will find a decided help in designing. I am going to write this article with the supposition that the reader knows nothing about spiral gears beyond having seen them, so that it will be as intelligible as possible to all of my readers.

If the reader will get the idea firmly fixed in his mind that a spiral gear is nothing but a short section of a multiple-thread screw, or of a worm, and that the driver and the driven bear the same relation to each other as a worm and wheel, he will have made quite a step toward an understanding of the subject. If he will further bear in mind that, owing to the great lead and the similarity of form between the driver and the driven, the worm may become the wheel and that, consequently, either one of a pair may be the driver, he will have gone still another step.

Just as we may theoretically unwind the thread of a screw and lay it out upon our drawing paper as a triangle whose base is the circumference of the screw, its altitude the lead and the angle of the hypothenuse the angle of the thread, so we may lay out a spiral gear and apply to it the same terms. Thus, a spiral gear having a tooth angle of 45 deg. will have a lead exactly equal to its circumference. A glance at Fig. 1 may help those to whom this is not entirely clear. Here the diameter C is spread out, as it were, into the circumference and becomes the base of the triangle, or C'. The line of the tooth B is extended on the tooth angle D and becomes the hypothenuse B', while upon completing the triangle, A' becomes the lead. In order to show the relation between spur and spiral gears, there is shown in Fig. 2 a diagrammatic representation of spur and spiral gears each having but two teeth, the others being cut away to avoid confusion.

A little consideration of the diagram will show that for a gear of a given number of teeth, as the angle of the teeth departs more and more from the right angle of a spur-gear tooth, one of two things must happen: either the diameter of the gear must be increased, or the pitch and size of the teeth must be decreased, in



FIGS. 4 TO 6. GRAPHIC METHOD OF REPRESENTING MATING HELICAL GEARS

order to keep the gear of the same pitch diameter. Fig. 3 shows the relation between the circular and the actual pitches of the teeth of spiral gears.

It will be seen that, if we do not wish to increase the

pitch diameter of our gear, we must have cutters that will cut teeth smaller than standard pitch in proportion to the increase in angle. This would mean that for every change in tooth angle, be it only by one degree, we would have to use a different cutter, and no two gears of different angle, even though they had the same number of teeth, would have teeth of exactly the same size. If, instead of this, we use a standard spur-gear cutter, all gears of the same pitch will have the same size teeth, like spur gears, but their pitch diameters will increase as the angle of their teeth departs from the zero angle of a spur gear. Now, as good workable spiral gears may be cut with spur-gear cutters, it follows that this is the most economical and satisfactory method to follow in designing them.

No special cutters whatever are required, while with the other system a special cutter is necessary for every gear. With the one system, a shop with the usual complement of spur-gear cutters is prepared to produce any gear that may be required; with the other system such an infinite number of cutters would be needed that it would be out of the question to carry them all on hand.

In designing a pair of spiral gears, the following factors are either fixed or known: The distance between centers, the ratio, the pitch, and the face width. In addition to the above, the maximum diameters are frequently set, and since these diameters may be varied at will, as has been already explained, we may make them to suit clearance conditions, and make the gear with the least number of teeth to have the largest pitch diameter.

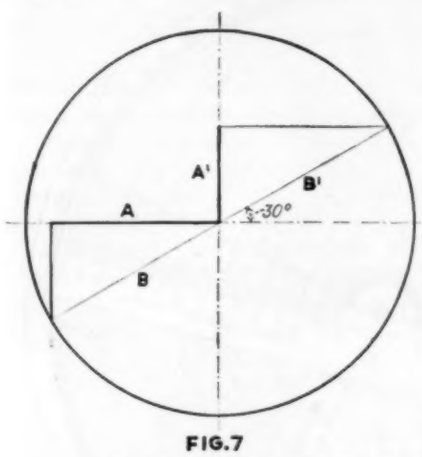


FIG. 7

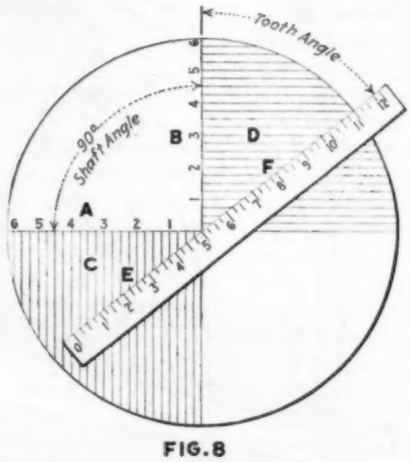


FIG. 8

FIG. 7. LAYING OUT GEAR DIMENSIONS. FIG. 8. SIMPLE CHART FOR DETERMINING GEAR DIMENSIONS

Our unknown quantities are: The pitch diameters, the number of teeth, and the tooth angles. Here we have three unknown quantities at once, and since they are all interdependent, the slightest variation in one will vary the other two. So how are we to start at our figuring? We are left to make a wild guess, and then flounder around by cut-and-try figuring until we hit upon the right combination.

Now, we may call the graphic method to our aid and obtain a close approximation to our requirements, so that very little figuring will be required.

Referring to Figs. 4, 5 and 6, we have in each, two triangles representing two spiral gears in the manner already explained, the angle *C* being the shaft angle, which in Figs. 4 and 5 is 90 deg., and in Fig. 6 is only about 45 deg. from two right-angles, at which point the gears would become spur gears. *A* and *A'* represent the pitch diameters of two spur gears having the same numbers of teeth and pitch and, consequently, the same ratio as the spiral gears. *B* and *B'* represent the respective pitch diameters of the spirals themselves, and *D* and *D'* are the tooth angles. In Fig. 4 the tooth angles are 45 deg. and the pitch diameters of the spiral gears bear the same proportion to each other as those of the equivalent spur gears.

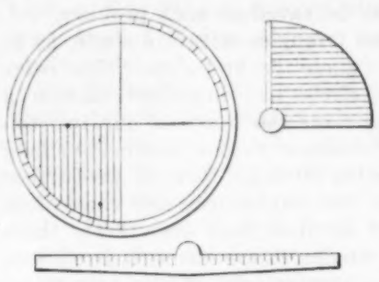


FIG. 9. PARTS FOR CHART

In Fig. 5 the angle is changed to about 30 deg. with the result that, while the number of teeth, ratio and, consequently, the equivalent spur-gear diameters remain unchanged, the pitch diameters of the spirals are so altered that not only is the center distance greatly increased, but the ratio of the pitch diameters to one another is so changed that the gear with the smaller number of teeth now has the greater pitch diameter. This, however, in no way alters the speed ratio of the gears, since we have not changed the number of teeth. It should be borne in mind, therefore, that the number of teeth in spiral gears and not the pitch diameters fixes the speed ratio, and this is what gives spirals their great flexibility.

In Fig. 6 we still have the same number of teeth, that is, the same equivalent spur-gear ratio, with the same tooth angle in the larger gear; but the shaft angle has been changed to 45 deg., so that the smaller gear, or rather the gear with the least number of teeth is now indeed the smaller gear.

Spiral gears may be laid out by this method and their various proportions determined approximately, the accuracy depending entirely upon the care with which the laying out is done, but the graphic method does not solve the problem of quickly finding the unknown quantities any better than the figuring method, for the one known quantity in our diagram is the combined lengths *B* and *B'* representing the combined pitch diameters of the two spirals, or twice the center distance. We know the ratio between the spiral gears, and consequently the ratio between the equivalent spur gears, but we do not know the exact sizes that will produce spiral gears to fit into our center distance.

It was to solve this problem of quickly finding the unknown quantities by a method of easily and rapidly varying them graphically that the writer devised an operating chart which he calls the spiral gear protractor, later described. To make our triangle elastic, as it were, was the problem. By operating the protractor or chart, we may easily and quickly vary all of the unknown quantities entering into the problem and obtain a close approximation to the desired solution, such as could only be found by repeatedly figuring and re-figuring. This approximation may be found in two

or three minutes at most, and then the problem need only be figured once or twice to determine the exact dimensions. It is safe to say that from a half hour to an hour of figuring may be saved on each problem.

Let us inclose our two triangles within a circle, as in Fig. 7, and we will have made the first step. Now refer to Fig. 8. Here the circle has inscribed therein a right angle, which represents the bases of our two triangles in their proper relation to one another so long as the shaft angle remains 90 deg. Now, if we further divide the bases of our two angles into any convenient number of fractions of an inch, and draw from these divisions lines at right-angles to the bases, it is obvious that we have two sides, respectively, of any two right-angle triangles, being limited only by the size of our circle and the value we choose to assign to our divisions. Now, if we lay a scale across our diagram, with the edge passing through the center of the circle, we will complete our two triangles, with the angles and dimensions varying according to the position of the scale.

For example, suppose that we were laying out 8-diametral pitch spirals. Our tooth angle would be the angle of the scale as measured with a protractor; E measured on the scale would be 5 in., the pitch diameter of one of the spirals; and F, $9\frac{1}{4} - 5 = 4\frac{1}{4}$ in. would be the pitch diameter of the other spiral. Following C up from E we get on A at 4 in., the diameter of an equivalent spur gear, and consequently the spiral gear E would have 32 teeth. Employing the same process with F, we get 3 in., or 24 teeth.

After using the charts, as in Fig. 8, several improvements suggested themselves. It was seen that it would be an advantage to have the scale rotate about the center of the card, and also to have it graduated so as to read from the center towards both ends. It was further seen that, if one of the two quadrants was pivoted at the center, so as to permit its angle with the other quadrant to be altered, the device could be used for gears having shaft angles from 90 deg. down to parallel or spur gears. The device therefore resolved itself into the form shown in Fig. 9, the circular card, the quadrant and the scale. The complete protractor is shown in Fig. 10. The illustration was prepared from one that is 9¼ inches in diameter.

In Fig. 11 is shown a diagram of the protractor set to a shaft angle of 25 deg. and with the two triangles ABF and $A'B'F'$ marked in heavy lines for the sake of clearness. The quadrant D is set to the 25-deg. shaft angle, and the scale is reading to tooth angles of about 32 and 58 degrees.

Construction of Protractor

It will be observed that the working protractor shown in Fig. 10 has a half circle instead of a quadrant. The reason for this is that when the shaft angles approach parallel and the tooth angles are very rank—that is, when one of the gears is almost a spur gear—it will be found that the scale will swing past the 90-deg. line of the swinging sector, and it is necessary to have another quadrant in which to read the result. It will be further observed that the quadrant commonly used is the one in which the answer to our problem is read. Here we read on the margin "THIS SIDE, SPIRALS OF SAME HAND"; and when the reading is in the other quadrant, it reads "THIS SIDE, SPIRALS OF OPPOSITE HAND." This means that after we pass a certain combination of shaft and tooth angles, our spirals, instead of both having their teeth cut to the same hand, one of them must be cut right-hand and the other left-hand. When spirals are used to drive parallel shafts, as in the case of some French lathe headstocks they are always cut right and left hand. The French arrange their lathe back gears so that the back-gear shaft and the spindle sleeve have each a right- and a left-hand spiral, thus neutralizing the thrust. Gears having shaft angles of 90 deg. are invariably of the same hand, and it is rarely that they become of opposite hands until the shaft angle becomes 60 deg. or less.

It should now be easy to understand the complete protractor, as shown in Fig. 10. The circular card A

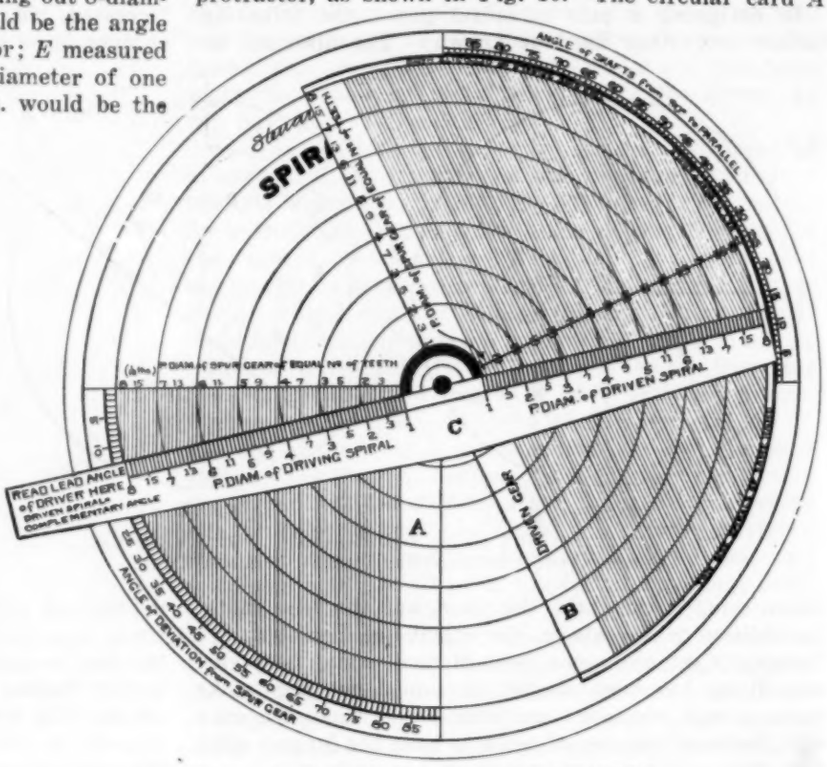


FIG. 10. THE "SPIRAL" GEAR PROTRACTOR

has two diametrically opposite quadrants, the lower left-hand one being graduated on the margin to degrees and marked "ANGLE OF DEVIATION FROM SPUR GEAR." It is also divided into the vertical lines which are figured for scales of half and quarter size, and marked "PITCH DIAMETER OF SPUR GEAR OF EQUAL NUMBER OF TEETH." This quadrant is used for reading the diameter, number of teeth and tooth angle of the driving spiral. The other quadrant is graduated in degrees only, and is used for setting the movable sector to the shaft angle, and is marked "ANGLE OF SHAFTS FROM 90 DEG. TO PARALLEL." The tooth angle of the driven gear is always the complementary angle of the driver, allowing for the shaft angle.

The movable sector *B* has two quadrants divided with vertical lines like the circular card, and marked in the same way. It has the marginal directions with regard

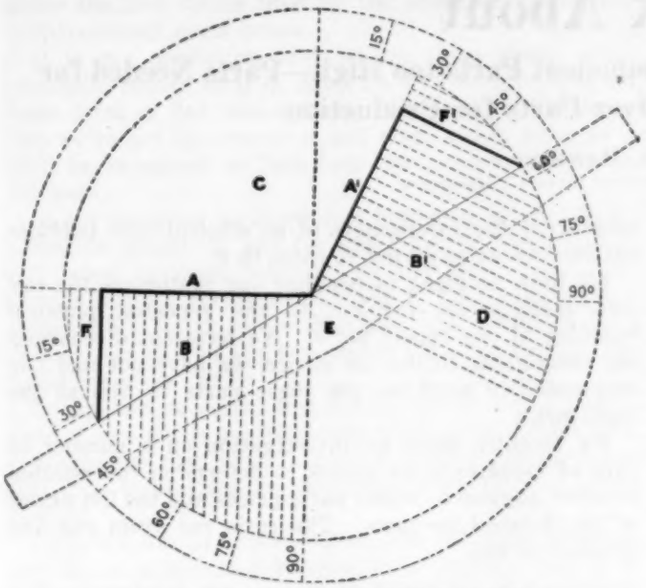


FIG. 11. READING THE PROTRACTOR

to the hand of the spirals, as already explained. It is used, of course, for the driven gear.

The swinging scale is graduated in half and quarter size to match the quadrants, and reads from the center toward both ends. On its scale we read the pitch diameters of our spiral gears, and from its angular position we read the tooth angles. It is marked on the right-hand end, "PITCH DIAMETER OF DRIVEN SPIRAL," and on the left-hand end, "PITCH DIAMETER OF DRIVING SPIRAL." On the extreme left-

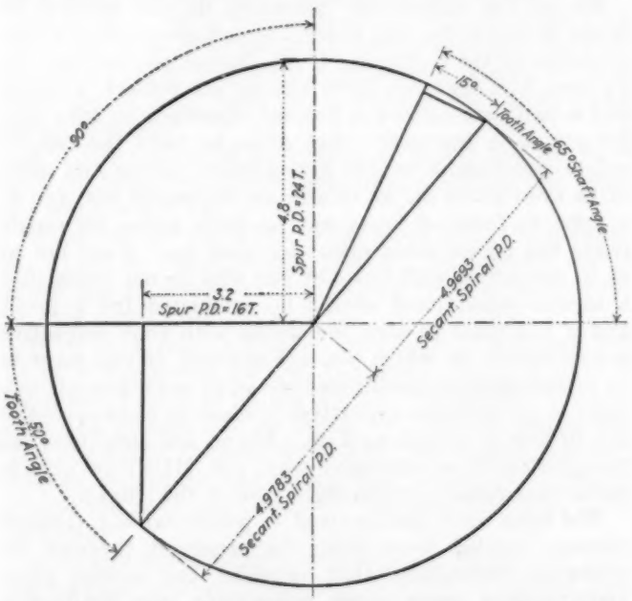


FIG. 12. ACCURATE SOLUTION OF A GEAR PROBLEM

hand end of the scale is marked, "READ LEAD ANGLE OF DRIVER HERE." "DRIVEN SPIRAL = COMPLEMENTARY ANGLE."

Let us conclude with a concrete example of the use of the protractor. Suppose we have two shafts whose centers are 5 in. apart and set at an angle of 65 deg. from parallel. We desire to drive from one to the other with a pair of 5-diametral pitch spiral gears having a ratio of 1 to 1½, but of equal diameters. It has already been explained that this is possible by varying the tooth angles.

Set the central dividing line of the sector *B*, marked "SET TO SHAFT ANGLE," to the 65-deg. angle, as indicated on the margin of the circular card *A*. As previously explained, the tangent lines on card *A* and sector *B* represent what our gear diameters would be if their shafts and teeth were parallel, in other words, if they were spur gears. The actual diameters increase as the tooth angles depart from the square line of a spur gear tooth. The spiral gear pitch diameters will be found on rule *C*.

We now proceed to find the desired tooth angle, placing the scale *C* in various positions, until its angle is such that two equal diameters of 5 in., representing the necessary pitch diameters of the two spirals, as marked on this scale, coincide with the tangent lines referred to above, originating from two spur-gear diameters having a ratio of 1 to 1½.

We will find that when the scale *C* is set to an angle of 50 deg., 5 in. on the left-hand scale coincides with 3.2 in. on the card *A*, and 5 in. on the right-hand scale coincides with 4.8 in. on sector *B*. Therefore, our driving gear will be approximately 3.2 in. in pitch diameter, and its tooth angle 50 deg., while the driven gear will be 4.8 in. in pitch diameter and its tooth angle 65 — 50 = 15 degrees.

The precise angles may now be determined by a little trigonometry, without the repeated trials that would be necessary if we had to depend entirely on calculation. To obtain the exact dimensions of the spiral gears, construct a diagram as shown in Fig. 12. Our shaft angle is already fixed, the tooth angles have been determined on the protractor and it only remains to ascertain the exact pitch diameters. To any one familiar with trigonometry, it will be plain that our spiral pitch diameters are the hypothenuses of our two angles whose bases are the spur pitch diameters, and therefore we have only to multiply these base dimensions by the secants of the tooth angles or use the more usual formula: 1 ÷ cosine = secant.

Therefore, since the spur P.D. ÷ cosin. 50° = spiral P.D., 3.2 ÷ 0.64279 = 4.9783 in. for the driver.

And, the spur P.D. ÷ cosin. 15, or 4.8 ÷ 0.96593 = 4.9693, spiral P.D. of the driven.

Our centers will then be:

$$\frac{4.9783 \times 4.969}{32} = 4.9738 \text{ in.}$$

This is as close as it is possible to get to the desired center distance of 5 in. without changing the relative spiral pitch diameters; that is, making them unequal, or by cutting the spirals a little over size, which is perfectly practicable.

It has already been explained that no special cutters are required, but that standard spur-gear cutters may be used. We cannot select these by the usual method, i.e., by the number of teeth of our gear, but the following formula must be used: Divide the number of teeth in the gear by the Sin^3 of the tooth angle, and the product will be the number of teeth for which to select the cutter.

Something for Service Station Men to Think About

Causes of Service Cost to the Producer—Component Parts too High—Parts Needed for Repairs Take Precedence Over Parts for Production

By Norval A. Hawkins
Director of Sales Section, General Motors Corporation

TODAY the automotive manufacturing industry in the United States represents an investment of over two billions of dollars. There are about 700,000 individuals directly engaged in the manufacture of motor vehicles, parts and accessories, and in addition there are more than half this number directly identified with the retail sales and service end of the business, giving a total of approximately one million people who are making a living for themselves and their families directly from this, the second largest industry in the world.

There are five causes and *only* five causes of service cost to the producer, or the car owner or both. They are as follows:

(1) Faulty engineering design; (2) faulty production, including careless workmanship, and faulty material or both; (3) incompetence on the part of the service repair men; (4) incompetence on the part of the user; (5) the wear and tear of normal use.

The first, second and third causes for service expense are directly within the control of the manufacturer, and we as service managers should make it our business to take some interest in the fifth cause.

Service should properly begin with the design of the car—in fact it should begin with the very conception of a product and it should be projected through the engineering, manufacturing and marketing process, assuming an ever increasing importance after the product is in the hands of the user and until the time that it is ready for the discard through legitimate and honest wear—*after having given an adequate return on the customer's investment.*

Three Kinds of Service

Service, in terms of our industry, divides itself into three classifications:

1. Parts manufacture and distribution.
2. Mechanical repair work.
3. Moral or psychological service.

The reason that many dealers have failed to make a profit on their parts business is because we fellows back at the factories have *guessed* at what they needed rather than making it our business to *know* what they were going to require. The result has been reflected in great volumes of telegraphic orders, express shipments and unnecessary expense to the car owner.

Within our own organization we found through a careful analysis that from 20 to 35 per cent of all repair parts orders during the first six months of 1921, were telegraphic and that almost 50 per cent of our parts shipments were going forward by express or parcel post as rush orders with a consequent high percentage of errors.

Scientific anticipation of repair parts requirements and the distribution of parts on a wholesale basis are necessarily the forerunners of an efficient unit package system and we've all got to come to it.

We have no right to penalize our customers for our own inefficiencies incident to the repeated physical handling of our repair parts. We have not discharged our obligations to the car owner, we have not met our responsibility until we get these parts to him at the right price.

We recently made an investigation on a number of cars of representative makes to determine the relation between aggregate repair parts prices and the list prices of the finished products. The ratio ran from one and one-half to two.

Discrepancy in Costs of Parts and Assembled Car

Why should it be necessary to get twice as much for a disassembled car as you get for an assembled car? The complete car has a great deal more mechanical labor chargeable to it. There is always an unavoidable breakage of material incidental to the assembly process. It is supposed to require a more expensive type of salesman to sell a finished car and it is usually necessary to demonstrate it before consummating a sale.

It surprises me to learn that a number of companies have even discontinued the practice of supplying owners with parts catalogs.

We, of the automobile fraternity do not hesitate to spend $7,500 in the Big Weekly to call our product to the attention of the buyer and if Mr. Buyer answers the ad, we send him eighteen form letters, six folders, a dollar and a half catalog and a liveried chauffeur to take him for a ride in the park—then after he buys the car we refuse point blank to give him a parts catalog and some of us even go so far as to attempt to charge him for it.

I am in favor of lower and uniform prices on repair parts but please don't misunderstand me. I am not at all in sympathy with those of you who do not think that a service department should be conducted for a profit and if you want to earn the status with your respective organizations to which you are entitled, if you want to be looked upon as producers instead of parasites—if you want to be business executives instead of clerks—you've got to look at it just as I do. If you are ambitious for recognition in an executive way, you MUST be able to show your results on the right side of the ledger.

We have just inaugurated a policy within General Motors, handed down from the president through the executive committee, that provides for service parts requirements being given precedence over production requirements, first, last and always—irrespective of the new car orders on file—and without consideration for any temporary financial loss.

We have arrived at the very sound conclusion that keeping the old cars running is of far greater and more lasting importance than the matter of getting the new cars sold.

The old car owner must be given first consideration if

Extracts from a talk before Service Managers' Meeting of National Automobile Chamber of Commerce.

we expect to get new car owners. The repair parts phase of the industry must be conducted for profits but these profits must come through greater efficiencies all along the line rather than by the maintenance of prohibitive repair parts prices.

It is my prediction that within three years every reputable repair shop in America will be operating on some form of flat rate system. Whether we like it or not, we've got to come to it and when we *do* come to it we'll be surprised at just how low our past efficiency has been.

In our *factories* we know just how long it takes to do a specific operation, and the exact cost of the material and labor involved, whereas on the other hand, our service stations refuse point blank to tell a man what a repair job is going to cost him and as a matter of fact, they seldom charge any two people the same amount for doing the same job.

To me the necessity for standardizing repair operations is so obvious and so simple of accomplishment that it makes me mad when I hear a service manager say that it is impractical in connection with his particular product.

I'd like someone here to tell me the difference between putting on a steering knuckle in a factory and in a service station insofar as the problem of cost analysis is concerned.

Moral or Psychological Service

And next we come to our third classification of service, namely, *moral* or *psychological service.*

In addition to the tangible repair parts distribution and mechanical phases of our service activity, there is this intangible moral phase.

Take the matter of keeping cars clean in a repair shop. A man may bring his car into your service station ever so dirty but this does not license you to turn it back to him in a still more untidy condition.

In the first place, the repair shop itself should be kept clean and there is no necessity for the mechanic to wear the same pair of overalls throughout the season without washing. A clean repair shop is one of the dealer's best advertisements.

A repair job should never have a *"finish"* tag put on it until the body interior has been dusted out and the steering wheel wiped off.

When the bill for a repair job runs over $15 I would say that the dealer should give the car a wash and a polish free of charge and he'll find it the best investment he ever made.

If I sent a coat to a tailor shop to have a button put on or a rip sewed up and the tailer spilled a can of machine oil on it or let his dog use it for a bed, I would raise the dickens and so would you, and yet every day cars are being turned out of our "authorized service" stations so greasy and mussy that after you've ridden around the next block you're a fit candidate for a Turkish bath.

Even our finest closed jobs are not immune—in fact, the average mechanic seems to fairly revel in the joys of disseminating grease and oil on a broadcloth interior—he may miss the universal joints, the transmission and the differential but the front cushion and the steering wheel—*N-E-V-E-R!!*

Manufacturers have made much progress during the past five years in the development of enclosed jobs with piano finish and luxurious appointments. The most painstaking care is used in the selection of the proper material for the cushions, carpets, curtains, etc., but the average garage mechanic on the other hand has not yet learned to appreciate the difference in fineness between a $10,000 limousine and a truck.

In the future, automobiles and the service that must inevitably follow will have to be sold and sold hard—our most valuable allies are the 9,000,000 car owners whose continued good-will rests largely in the hands of the service men.

It is to you men we must look for the greatest future development of the automotive industry as a whole—and remember that *"He profits most who serves best."*

Rapid Drilling of Barrel Covers

Special Correspondence

A sanitary barrel made from steel metal and intended for the holding of such materials as sugar and flour, required the drilling of four small holes in the periphery

MACHINE FOR DRILLING A BARREL COVER

of the head. Since rapid production of the heads was desired, the arrangement shown in the accompanying illustration was developed.

The machine consists chiefly of four ¾-in., 220-volt, Black & Decker portable electric drills. The handles and the switch mechanisms of the drills are not used, the housings being mounted on slides resting on a heavy table. The slides are operated simultaneously by means of a pedal, so that all the drills can be fed to the work at the same time. The drill bits enter through jigs having hardened bushings, and a fixture is provided for holding the barrel head.

When operating the machine, the attendant merely places a barrel head in the fixture, and then presses his foot on the pedal to feed the drills through the work. There is a retaining ring on one side of the work-holding fixture to keep the head from rising, while the operator holds the other side so as to prevent vertical motion and vibration.

A Hollander's View of Leipzig Fair

By D. DeVries
Manager, R. S. Stokvis & Zonen

The writer is just back from Germany where he visited the Leipzig machine tool exhibition. It would be very instructive for an American to visit such an exhibition. If one to whom each machine is an old acquaintance, no matter what its changes in design, strolls along the various stands, his eye is caught here and there and he says, "Not bad, by Jove, the Americans have big competition."

Take, for instance, the stand of Raboma radial drills. Here is a big drill but if one compares it with a modern American machine he will say, "Well, that machine is an engineering problem to the workman. Too many ornaments. It needs a college graduate to handle it."

We had a talk with Samson, makers of vertical grinders of the Pratt & Whitney type. They also make a shaper which the manager pretended was a copy of a Gould & Eberhardt shaper, but he was only pretending it was a copy. It might have been a copy of an obsolete Gould & Eberhardt shaper, but both Mr. Peskine and I laughed heartily in his face and told him, "You Germans try to copy and when you are ready with your copy the American again has escaped and looks only upon it as of bygone days."

The general impression of such an exhibition, and it was a big exhibition only of machine tools, is that there is life and drive in the Germans, but that the class of their machines and the class of their workmanship is miles below the American standard. On the other hand they manufacture cheaply and today there is but one desire in the world, "Buy cheap, buy cheaper, buy cheapest, buy for nothing." Quality does not speak any more in Europe, it is the price that talks and as long as German labor is as cheap as it is today and the call for low prices as strong as it is now, the machine tool world of today belongs to the Germans.

We saw copies of Cincinnati milling machines with Wanderer and copies of Kearney and Trecker with Mammuth, but what poor copies they were. We explained to one of the representatives the treatment through which gears go in America before they become gears ready to be put in place, and he listened with open mouth and then said, "Just think, that's nice, but we would not get paid for it." Cheap, you see!

In lathes there was nothing special. A good German lathe sells for one-quarter, or less, of the price of an equivalent American tool.

The German workman works and produces today for five American cents an hour. He has to fight for weeks and weeks in order to get another two cents and that is why Germany is not able to buy. A few people are earning heaps of money, but because it is in paper marks they try to spend it as soon as they get it, so you see much luxury in Germany. Big dinners, filled hotels, wine and champagne and what surrounds it, but the greater percentage of the people live in poor condition. The splendor of the rich is displayed but the poor suffer in silence within the walls of their houses.

While America, England, France, Spain, Italy and smaller countries are struck with a depression worse than any living man can remember, there is a big boom in Germany. Most of the machine tool firms are sold out for six to eight months and everybody at this exhibition looked gay and prosperous. Everybody had booked big orders. They had their inland prices for Germany and export prices planned according to the rate of exchange, one scale for Holland, another for France and still another for England, all fixed by conventions and committees. It was noticeable how many Englishmen visited the exhibition willing to buy and buying. It was estimated that about 3,000 Dutchmen visited the show and there were many French, Belgians and Scandinavians, but few Swiss and hardly any Italians and Spaniards. A committee of the Russian Soviet visited the exhibition and we saw some Japanese and Chinese, but the great majority were the Germans themselves.

According to the present export organization which Germany has shaped for herself, machinery can only be exported at a fixed price, a price about twice as high as the domestic price but about half what the rest of the world asks. They have formed, so to say, a world of their own in which they all prosper and live on the rest of the world and one is forced to ask whether it is better to win a war or to lose it. At present the losers seem to be on top but common sense will say that such a thing cannot last forever and when the break comes it will be an awful one.

The present boom can only continue as long as the mark keeps on depreciating in value. The exchange today is about 250 marks for the dollar, so a little more and the mark has no value at all. What then? Then misery must come as it came gradually but with certainty in Austria and Russia, and another section will be added to that part of the world from which the rest can expect nothing for the happiness of the whole. The Germans do not deserve such a condition. They are a hard working, industrial nation who are doing their best to keep pace with the rest of the world. However, when it comes to a really excellent design and progressive ideas in the machine tool line, they lack initiative. They are too much out for success in another way than the Americans. If an American manufacturer cannot produce a thing for less than five thousand dollars, he will not offer it for less even if he gets no orders, but if a German cannot get five thousand dollars, he will try to get the order for four or for three or even for one thousand dollars, sacrificing everything for being booked well ahead with orders.

Our final impression of this visit to the Leipzig exhibition was that Germany is not killed at all, but keenly alive and that in the long run she will fit into her own place. That place, however, will not be the place the American machine tool builders are looking for, which is to be at the top in design and workmanship, in service and production.

Copy of a personal letter written to a friend in America and printed by permission.

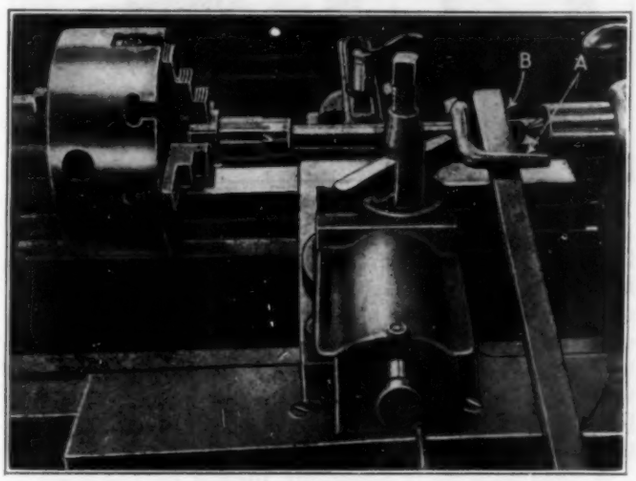
Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Avoid Danger When Drilling in a Lathe —Discussion

BY S. KELLY

The article on page 271 by Harry Senior, entitled "Avoid Danger When Drilling in a Lathe," covers a subject that has received a great deal of consideration in AMERICAN MACHINIST and similar publications. Each writer usually suggests some modification of this dangerous and pernicious practice of drilling or reaming holes by means of a drill or reamer held upon the tail



THE WAY TO MAKE A DANGEROUS JOB SAFE

center and prevented from turning by a *single ended lever* consisting of lathe-dog and tool shank, steel bar, or "pine stick."

The use of such a lever in this manner tends to cause the end of the drill or reamer to rise and the greater the pull upon it the greater is the power exerted, due to the lifting effect of the lever, to force the end upward and off center.

The way to make the best of a bad situation is, as Mr. Senior describes, to fasten a dog to the reamer shank, allowing the tail to rest upon a tool, bar, or pine stick in the toolpost in such manner that the carriage is eased along with the feed of the tail spindle and thus prevents the reamer from moving forward sufficiently to allow it to jump off the center.

With one hand feeding up the tail spindle while with the other he tries to "ease" the carriage along so that the toolpost will always bear firmly against the dog, the machinist certainly has his hands full. Is it any wonder that there should be so many machinists with mained hands and fingers?

There is but one safe and sane way to perform such a job, and that is to use drills and reamers having standard taper shanks to fit into a socket, or sockets, in the tail spindle. By this method there is no danger when the tool breaks through the work.

Superintendents, foremen and factory inspectors should forbid the use of the dog and single end lever, even when used in conjunction with a "pine stick."

[This letter was submitted to Mr. Senior and his reply is printed herewith—Editor.]

Your correspondent did not read my letter understandingly. This may have been my own fault in that I did not make the operation entirely clear and to remedy such defect as well as to prevent further misunderstanding and make certain that I have mitigated to some extent the evils of what may be a really dangerous job, I have this time included an illustration.

There is no such thing as a "single-ended" lever. I need not enter into a discussion of the various classes of levers, for I am sure that all mechanics know that to be a lever at all a piece must have a weight to move (or resist), power applied to move it, and a fulcrum or point of resistance. Whether my pine stick is a lever of the first, second or third class depends upon the individual conception as to which points represent the three factors; but it most certainly has two ends.

In the illustration let us suppose that the reamer has "snagged," the lathe is stopped, and the full power of the belt is being delivered to the holding device, tending to throw the shank off the center. The tail of the dog is bearing down upon the stick at *A* which, as Mr. Kelly says, would tend to lift the reamer shank off the center. But the downward pressure must be supported somewhere, and it *is* so supported at points *B* and *C*.

Because of the fact that the distance from *A* to *C* is, let us say, ten times the distance from *A* to *B*, nine tenths of the downward pressure delivered by *A* reappears as a downward pressure delivered by the stick upon the reamer shank at *B*. The tendency of the shank to rise by reason of the pressure delivered at *A* is, therefore, so nearly balanced by the downward pressure of the stick at *B* that the resultant is negligible. The further away the point *C* the more nearly is the balance established.

As regards "easing" the carriage along by hand—don't do it. Make sure that the tool shank (or whatever you put in the toolpost) bears against the yoke of the dog in such a way that the reamer cannot move toward the chuck without also moving the carriage, but be equally sure that it is so placed that it cannot interfere to prevent the reamer, dog and all, *from rotating with the lathe in case the stick should break.* You can then forget that the carriage is there; the pressure of the tail spindle will do all the "easing" that is necessary while the carriage will stay on the job ready to prevent any forward movement induced by the tendency of the reamer to "draw in," or when the drill breaks through the work.

There are two objections to the method, suggested by Mr. Kelly, of using taper shank tools. In a manufacturing operation upon specially fitted machines this would unquestionably be done; but in the toolroom and

the job shop it is often necessary to use tools that have no taper shanks, and even if such tools are available the feather and spline in the tailspindle of the average engine lathe is not calculated to shoulder the responsibility of resisting the torsional strain of the cut.

A Device for Riveting Small Parts

BY CASPER J. DORER

It is often necessary when riveting small sheet-metal parts together on a large production basis, to have the two parts held together in an accurate relative position and to have the rivets driven accurately. Too often this fact is lost sight of, with the result that the rivets are driven in crooked, are never tight, and eventually shake loose. The rivets can also be made to serve as dowels, if properly set. The accompanying illustrations show a type of riveting fixture which is being successfully used for this kind of work in our production department.

The rivet used in this particular case is $\frac{3}{4}$ in. long and 0.070 in. in diameter. Owing to the smallness of the rivet, it is necessary to set it in place with a small pair of tweezers. The two pieces of stock are 0.015 and 0.097 in. thick respectively, and are attached to a shaft 10 in. long, which extends downward through the center of the fixture and through a clearance hole in the bench.

The fixture is easily and very quickly operated by an inexperienced operator, is foolproof and requires no hunting or balancing of the rivet head with the punch. It is generally this part of the operation that consumes the most time.

Upon examination of Fig. 1 it will be seen that the punches *A* are held in a vertical plane in the bracket *B*, the bearing being fairly loose. These punches are always held in their operative position away from the work by springs, and kept from coming out by screws *C*. When struck with a hammer these punches always

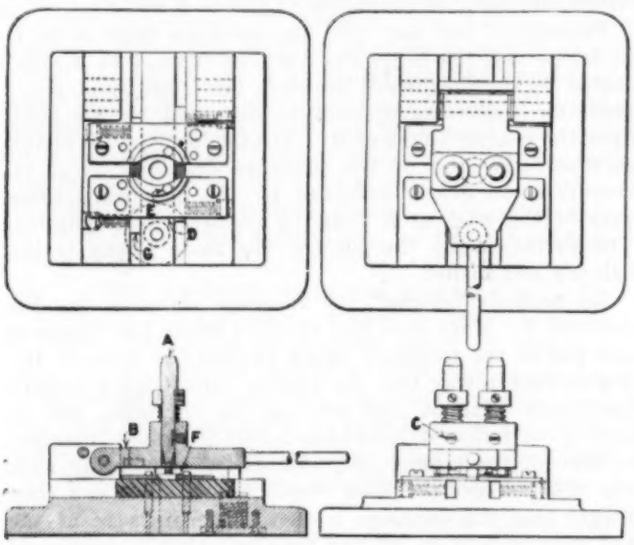


FIG. 1. DETAIL OF RIVETING FIXTURE

impart a perpendicular blow on the head of the rivet even if the operator should strike the top of the punch a deflecting blow. In order to prevent the rivet from sliding out from under the punch in case the rivet is not set square, the end of the punch is contoured slightly to suit the head of the rivet, thus causing the rivet to line up when the punch strikes it. Care must be used in forming the ends of the punches so that the concave part is not too deep as it is apt to cause the punch to split. The punches must also be placed in correct alignment with the rivet holes so that the force of the blow goes directly through the holes and is not deflected to one side.

The two pieces of work are placed in a nest *D* and over locating pins *E*, which keep them in their correct relative position while riveting. The bracket *B* is then swung down over the work until the button *F* rests upon

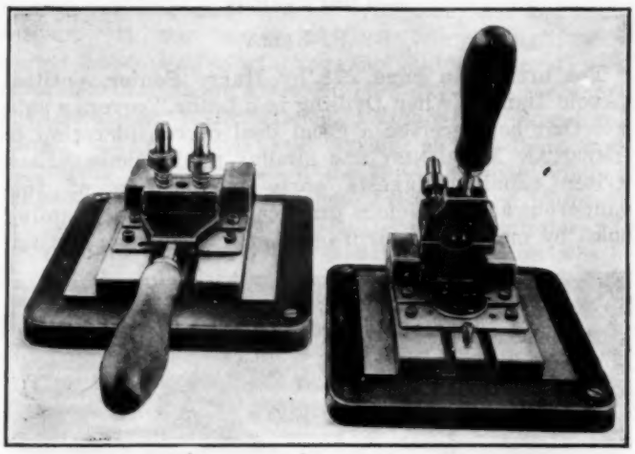


FIG. 2. THE FIXTURE IN OPEN AND CLOSED POSITION

it, the operator continuing to press down upon the handle so as to hold the work tightly together while he strikes the punches a blow with a hammer held in the other hand. It is essential that button *F* be of correct length so that punches will be in a vertical plane when the bracket is resting on the work. Thus the bracket serves a double purpose, acting as a guide for the punches and a clamp for the work.

A head such as is commonly formed on the opposite side is not made in this case. Instead the rivet strikes against the serrated hardened tool-steel strip *G*. The strips are set in the base of the fixture and are shiftable endwise, thus making it easy to renew the riveting surface. They are held in place by setscrews set in from the side.

The half tone, Fig. 2, shows the fixture both in open and closed position.

Enlarging Gas Engine Pistons

BY IVAN C. BEACH

In reference to a letter by David Tyke, on page 287 of AMERICAN MACHINIST, the writer had a similar experience when he was called upon to refit pistons that were only a few thousandths under size.

I heated the pistons to a good red heat, stood them on a smooth plate (an old faceplate) on the floor with the solid end up and placed a weight of about twenty pounds upon each. When they had cooled I found that they had expanded about 0.012 in. and I had no difficulty in fitting them.

[The "swelling" of cast iron by repeated heating and cooling is often done. We doubt if the weight helped any. Have any of our readers data upon the amount of enlargement that can be thus obtained, or the wearing qualities of iron so treated?—Editor.]

A Shop Man's Method of Figuring Change Gears—Discussion

By H. Herring
Stockport, England

I have read with interest the article by J. Crommel, on page 78 of American Machinist, entitled "A Shop Man's Method of Figuring Change Gears," for the reason that I have myself been in the habit of using this method for many years. I think, however, that Mr. Crommel might have carried the matter a little further and shown how to arrive at the correct position for engaging the split- or half-nut with the leadscrew.

Let us take Problem I: Required, 60 threads in 4 in.; leadscrew 5 per inch. The lead of the thread is 4/60 and the ratio of change wheels 4/60 x 5/1, or 4/60 ÷ 1/5 = 20/60, or 4/12. If we reduce this ratio to its lowest terms we get ⅓. This indicates that the leadscrew makes one revolution to every three of the spindle. In this case we can engage the nut with the leadscrew at any point of the lathe bed and the tool will come into pitch again for each successive cut.

Problem II: Required 27 threads in 5 in.; same leadscrew. The fraction expressing the lead is 5/27. Ratio of change wheels is 25/27; which is the lowest term. The nut can be engaged at every twenty-fifth revolution from the starting position, or, if the spindle and lathe bed have been marked, the nut can be engaged at every fifth inch, or multiples thereof, along the lathe bed.

Problem III: Required 10 threads in 7 in.; leadscrew 2 per inch. Fraction representing the pitch is 7/10. Ratio of change wheels is 14/10, which, reduced to its lowest terms, is 7/5. The half-nut can be engaged at every seven revolutions of the leadscrew or at every 3½ in. or multiples thereof along the bed.

Problem IV: Required 7 threads in 10 in.; same lead. The fraction is now 10/7 and the gear ratio 20/7. The half-nut will engage at every twentieth revolution of the screw or every 10 in. of its length.

Problem V: Required 4 threads in 4¼ in.; lead of screw 2 per inch. The fraction is 4¼/4, and the gear ratio 17/8. The nut will engage at every seventeenth revolution of the screw or every 8½ in. of its length.

I have found this method very useful when working on lathes that were not equipped with a carriage reversing movement.

Putting Limits on All Dimensions

By John Thomas

In the majority of drafting rooms, when dimensioning shop drawings, it is the usual practice to add tolerances only to those dimensions which require comparatively close limits and to give other dimensions merely a flat size such as 2½ in., 0.750 in., etc. As a matter of fact, such unlimited dimensions mean nothing more than that the work should be made to that size only approximately.

This practice seems to me to be a mistake. Before a piece of work can be made from such a drawing, someone must either decide or find out the leeway allowable on sizes lacking limits. This usually means much time wasted in looking up "how they made them last time," or in discovering someone who will take the responsibility for such a decision. Very often this does not settle the matter, for it all depends on whether the decision is based on a guess or on definite information.

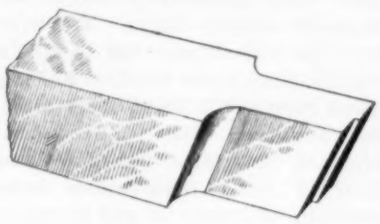
If we insist that our draftsmen limit all dimensions we will eliminate a lot of trouble and lost time in the shop. Often the operator wastes time in making a piece of work much closer to size than is really necessary, while the opposite may also be true. If ⅛ in. more or less can be allowed on the work, the operator should know it definitely instead of being permitted to use his own judgment which probably would not coincide with the ideas of the designer of the piece.

Definite limits will help the operator in every way. He will get started on the job in less time, and will save time wherever possible. Definite limits will give him more confidence and help him produce better work, simply because he will know definitely what is wanted.

Easing the Pressure of the Cutting-Off Tool

By S. J. Morgan

On page 185 of American Machinist, there is an article under the above title, written by Clarence B. Coe, in which he advocates the making of a groove in the upper surface of a cutting-off tool for the purpose of easing the chips so that they will not pack in the cut.



CUTTING-OFF TOOL WITH DOUBLE LIP

The sketch herewith shows the way in which we accomplish the same result. Merely grind back approximately one-half the cutting edge for a distance of a few thousandths, making in effect two cutting lips instead of one. Then when the tool is put to work it will cut off two narrow ribbons of material and there can be no trouble from the jamming or packing of the chips in the cut.

Broaching With a Bearing Ball —Discussion

By James Griffin

On page 419 of American Machinist, Amos Ferber questions the advantage of the ball method of sizing holes, particularly in drawing dies, if the holes are to be lapped after hardening.

If a microscopic study were made of the metal surrounding the holes made by the ball and the reamer methods respectively, the crystalline structure of the metal in the case where the ball was used would be found to be more compact and closer grained than when the hole is reamed. This gives better wearing qualities and, I think, is an advantage.

Cutting Bolt Holes in Shims

By F. W. Cheatham

When you have a number of bolt holes to cut in thin sheet metal or fiber shims, select an ordinary cup-pointed setscrew with the cup of a size that corresponds to the desired hole, place it with the cup end upward in a vise, lay the shim over it and strike with a smooth flat-faced hammer. After the usual experience in cutting holes in shims you will be greatly relieved to find how easy it is to do a good job.

EDITORIALS

A Guiding Hand for Trade Associations

THE dilemma in which trade associations find themselves as the result of the Hardwood decision continues to be the subject of much discussion. The most recent developments include the Hoover Conference at Washington and the introduction, in Congress, of a tentative bill by Senator Edge placing such associations under the Federal Trade Commission; and of a Joint Resolution, fathered by Senator Edge and Representative McArthur, providing for a congressional investigating committee.

"Business is entitled to know in definite terms what it may and may not do," declares the preamble of the proposed joint resolution. This declaration will strike a sympathetic chord in many a weary heart. For fifty years American business has been struggling to attain certainty in its legal status. Ever since the first halting steps in great combination movements legal uncertainty has been an ever-present condition. Under the old common-law doctrines, under the state anti-trust laws and under the federal Sherman Act, business has been operating under the handicap of indefinite and negative restrictions. The process has been one in which business, denied definite positive guidance, has tentatively adopted in its tendency toward combination one legal form after another—the pool, the trust, the holding company, the merger—only to be checked and turned back by the Supreme Court, which has finally evolved that marvel of indefiniteness—the "rule of reason."

The latest decisions have made it clear that combinations in restraint of trade cannot be erected under the guise of open-price associations. One more experiment tried and the check once more applied! Business now asks for a statement of what it can do. It demands an opportunity to submit plans for trade-association activities to the federal trade commission for approval or disapproval before operations are begun.

The uncertainty which has been present has been costly in the past; much more costly than is ordinarily realized. If one were to attempt to devise a plan for dampening business enterprise, it would be difficult to evolve a more efficient implement than a threat of illegality. This type of uncertainty is a perfect wet blanket.

We do not mean to infer that business should be left free to do anything it chooses. So long as competition is the force relied upon to protect consumers from high prices, it will be necessary to prevent by law combinations in restraint in trade. We merely point out that certainty as to what is legal and what is illegal would greatly simplify the problem of the business man. How can one proceed confidently so long as the rules of the game are undetermined and constantly shifting?

In this particular case, moreover, uncertainty is likely to be particularly costly. Unless positive guidance is given, the trade association movement will receive a blow which will prevent, in large measure, the performance of many functions which are highly useful in the economic process and quite free from objection on the grounds of restraint of trade. For the fact-finding function of the trade association is really a risk-elimination function. If a business man can make his plans and decisions on the basis of fact and knowledge rather than guess and speculation, he can price more closely, eliminating the reserves and insurance premiums which inevitably accompany the conduct of business when surrounded by uncertainties. Trade associations now supply much valuable data and can be so developed as to supply much more. Such data are essential to wise business decisions and will result in fewer losses to business men and lower prices to consumers.

The Edge bill may not be perfect. Senator Edge does not pretend that it is. But certainly his proposals are steps in the right direction. It is possible to define fairly precisely the things which trade associations "may and may not do," and Congress owes it to the business community and to the country to make this clear.

Selling the War Surplus

IF WE needed a sidelight as to the cost of war, the sale of surplus materials would afford a good example. Over a billion dollars worth has already been sold and about as much more still remains to be disposed of. Major Glen E. Edgerton, director of sales, is planning an intensive campaign to get the rest of it out of the way. He realizes that, in some cases, it will work a temporary hardship on industry. But it must be sold and he believes that it is better to have the operation over with than to drag along with mere palliatives.

Roughly speaking, one-half the property declared surplus, something over two and a quarter billion dollars, was transferred to other governmental departments. The actual surplus on hand and ready for sale on March 1, represented an original cost to the taxpayers of $190,000,000. Although the most saleable property has already been disposed of, there is much valuable material in what remains. The material still available includes electrical equipment, hand tools, engineering supplies, machine tools, scrap metal, railway material, office supplies and the like.

It is interesting to note that during the first two years the average recovery from sales was 73 per cent of the original cost. The present average recovery rate is 25 per cent. The average for the whole, however, is 48 per cent which, all things considered, is a very high rate.

The lower rate prevailing at this time gives an idea of the relative saleability of the remaining surplus, as well as the lower prices prevailing in the open markets this year.

When the sale is completed the country will be in a more healthy condition, the treasury will be richer, the decks will be cleared for new business and we shall be decidedly nearer normal business in every way. Let all who can, hasten rather than delay the completion of the work which must be done. And let us appreciate the work done by all who have assisted in its doing.

Shop Equipment News

Blanchard High-Power Vertical Surface Grinding Machine

The Blanchard Machine Co., Cambridge, Mass., has added to its line of surface-grinding machines what it believes to be the heaviest and most powerful vertical spindle surface-grinding machine ever built. Fig. 1

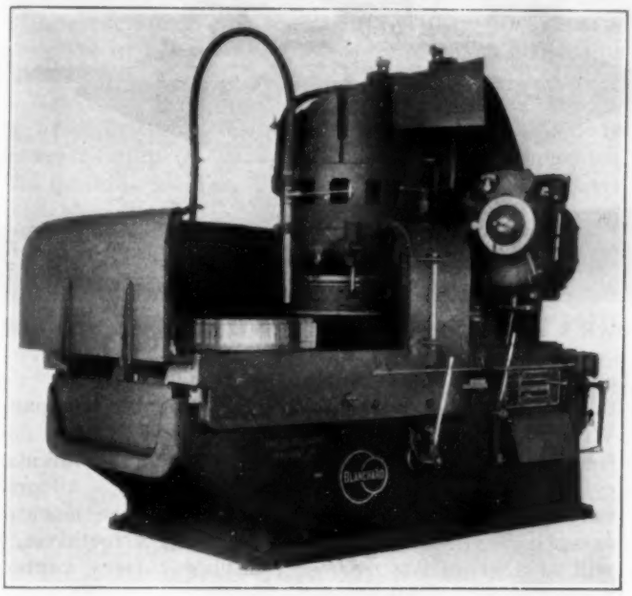


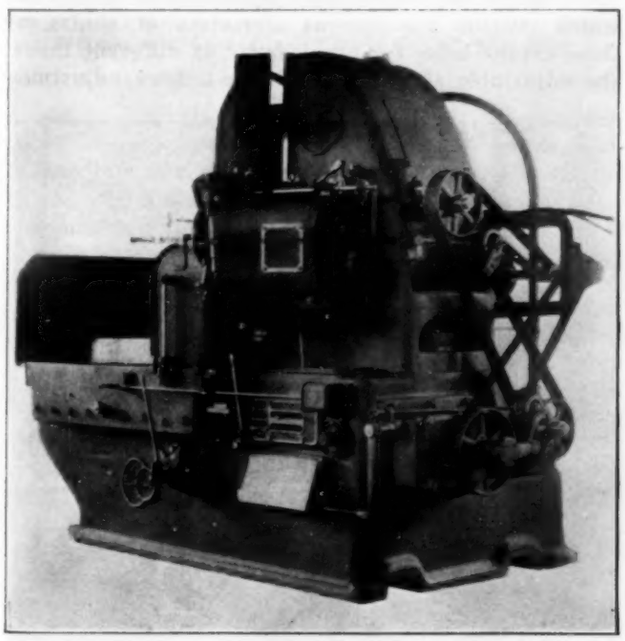
FIG. 1. BLANCHARD HIGH-POWER GRINDING MACHINE

shows the front view of the machine, which is known as the No. 27-R Blanchard high-power vertical surface-grinding machine. Overall dimensions of the machine are 12 ft. 6 in. long, 7 ft. 6 in. wide and 10 ft. high. The total weight is 30,000 lb. Floor space required is 12 ft. 6 in. x 7 ft.

In general arrangement it is similar to the No. 16 Blanchard grinding machine, and it operates in the same way. The work is carried on a rotary magnetic chuck, 48 in. in diameter, which is moved horizontally from the loading to the grinding position, and there rotated continuously while the wheel is gradually fed downward. Owing to its size and weight, the No. 27 chuck and table is traversed by power. In other respects the operation of the No. 27 is like that of the No. 16, although the mechanism is different.

The grinding wheel is 27 in. in diameter, 7 in. deep, with a rim either 2 or 3 in. thick. It is sulphur mounted in a cast-iron retaining ring, attached to the faceplate by six screws, and is wire banded in the same way as the No. 16 Blanchard wheels. The wheelhead weighs 3 tons and has built into it a 60-hp. 600-r.p.m. induction motor which drives the wheel at 580 r.p.m. or 4,170 ft. per minute. The rotor is directly on the wheel spindle, which is 5½ in. in diameter and is carried on two large radio-thrust ball bearings. A spring take-up at the upper end exerts an upward pull on the spindle which exceeds the weight of the rotating parts by 1,000 lb. This initial load on the lower or main thrust bearing eliminates all play or backlash. The main bearing has a thrust capacity of over 25,000 lb.

The wheel safety guard is of $\frac{5}{16}$-in. steel plate, carried on three heavy steel rods, and has a convenient rack and pinion mechanism for vertical adjustment. A wheel dresser attached to the head provides for dressing or sharpening the face of the wheel while grinding. There is the usual water supply to the inside of the wheel through a 2-in. pipe, and to the outside nozzle



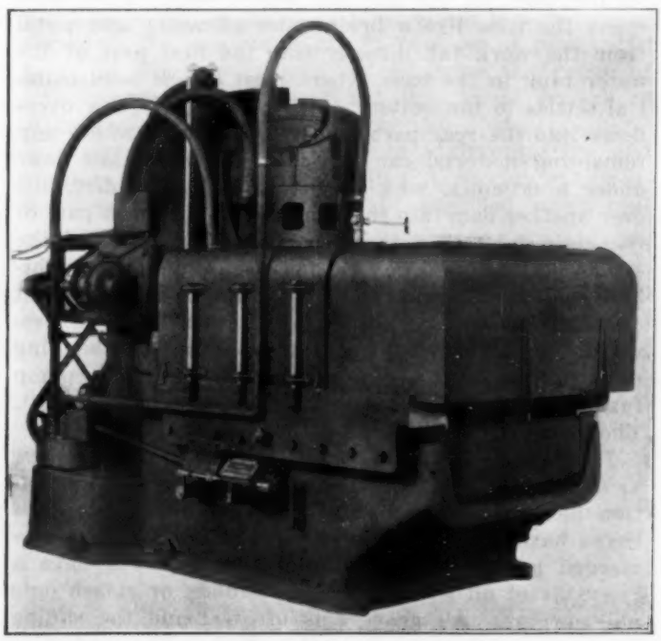


FIG. 2. RIGHT-END FRONT VIEW OF BLANCHARD GRINDING MACHINE. FIG. 3. REAR VIEW

through a 1½-in. pipe. Waterguards of ¼-in. steel plate, entirely surround the work and wheel.

The head is mounted to slide vertically on a massive column, whose proportions are best seen in Fig. 2. The Blanchard three-point support is used to fasten the column to the base.

The vertical motion of the wheelhead is controlled by a heavy feed screw, 4½ in. in diameter, carried in ball bearings in the column. This screw is driven through a gear box mounted in the column, receiving its power from the upper pulley in Fig. 2. Double friction clutches provide for rapid raising or lowering of the wheelhead. Both hand and power feeds are provided by means of the box on the front of the column. The power feed has an automatic stop, also a convenient adjustment, giving feeds from 0.0005 to 0.005 in. per revolution of the chuck. A single lever controls the engagement of the power feed and of the raising and lowering clutches, and is arranged so that they cannot be simultaneously engaged.

Referring further to Fig. 2, in the lower portion will be seen a large pulley which drives the chuck rotation, and to the left of it, the pulley which drives the water pump and table traverse. The chuck is driven through a four-speed sliding-gear box, with friction clutch for starting and stopping, interlocked with the gear shift. The speeds are 3, 5, 8 and 13 r.p.m. Power for all purposes, except driving the wheel, is supplied by a 5-hp. motor on the farther side of the column, to be seen in Fig. 3. This view also shows the pump and water piping and the box containing the clutches for the traverse motion of the chuck.

The rotary magnetic chuck for holding the work is 48 in. in diameter and is of the Blanchard one-piece steel type. It has closely spaced poles suitable for holding either small or large work. The face is of brass and steel, and is said to be absolutely waterproof so as to prevent damage to the windings.

The chuck is carried on a substantial table, sliding on the base on one flat and one V-way. This table spans the base like a bridge and all water and metal from the work fall directly into the first part of the water tank in the base, where most of the solid material settles to the bottom. From here the water overflows into the rear part, under the column, where any remaining material can settle. The water then flows under a skimmer, which holds back floating dirt, and over another dam into the pump tank. The first part of the main tank is cleaned from the left end, and the second part has a large cleanout opening near the right-hand end on the front. Both parts are so arranged that the entire bottom can be reached with the hoe provided, and an inclined end leading to an overhanging drip edge makes it easy to remove the mud. The pump tank is accessible for cleaning, but rarely requires it. The total water capacity is 42 gallons.

The machine is constructed throughout with a view to durability and low maintenance cost. The lubrication has been carefully studied, and both main gear boxes have pressure feed to every bearing from submerged gear pumps. Other important units have a reservoir of oil with means to circulate or splash onto all bearings. All gearing is of steel and the sliding gears are of heat-treated alloy steel. The protection against dirt and water is complete.

Brown & Sharpe No. 4 Universal and Crankshaft Grinding Machine

For use in motor service shops for grinding automotive parts, the Brown & Sharpe Manufacturing Co., Providence, R. I., has recently added to its line of grinding machines the No. 4 universal and crankshaft grinding machine illustrated in Fig. 1.

The machine is adapted to a large variety of work. It grinds crankshafts, pistons, wristpins, valve seats and stems, in addition to the regular straight and taper grinding of which a universal machine is capable. With an internal grinding attachment and chuck, it does internal and face grinding on such parts as individual cylinders, clutches, and transmission gears. All ordinary parts of motors can be ground in the machine, excepting cylinders *en bloc*. By using a toothrest, it will also grind line reamers, milling cutters, centers, boring bars, and other tools.

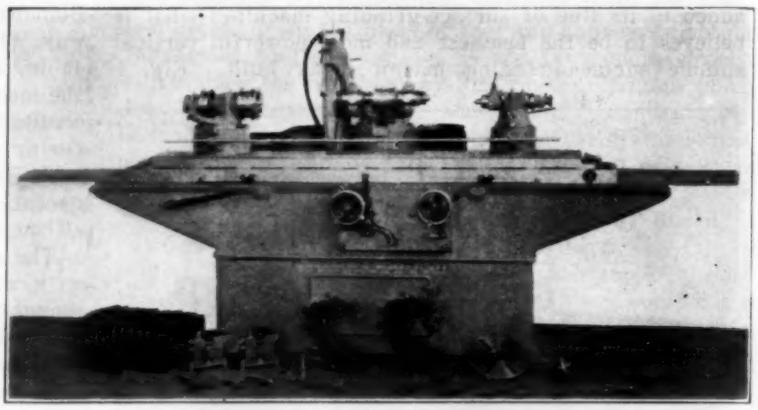


FIG. 1. BROWN & SHARPE NO. 4 AUTOMOTIVE GRINDING MACHINE

The throw-blocks are made with tool room accuracy, and their sides are finished to an exact size in relation to the center holes in the sliding blocks. This permits the crankshaft to be readily aligned by placing the blocks on their sides upon a surface plate. Other features of the blocks are the adjustable clamp caps which provide for various diameters of shafts, the three center holes for crankshafts of different throws, the adjustable slide for obtaining a finer adjustment,

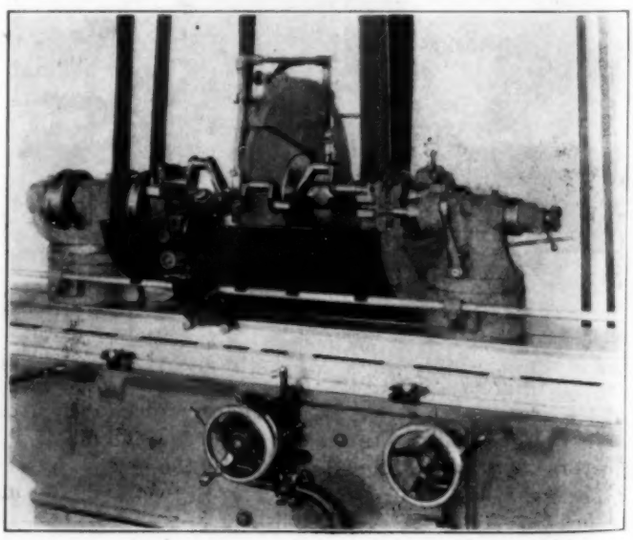


FIG. 2. GRINDING CRANKSHAFT ON B. & S. NO. 4 MACHINE

and the special extension of the slide block used on the headstock end of the crankshaft. This extension, with its recess, provides for grinding flanged crankshafts. A crankshaft in place is shown in Fig. 2.

The piston arbor permits of saving time in mounting pistons. The piston is mounted on dead centers and is also ground upon its own centers, which trues up a seasoned piston concentric with the axis upon which it was first turned. For valve grinding, the wheelslide is set at the desired angle and the corner of the wheel is moved across the valve seat. The table remains stationary and the crossfeed traverses the wheel across the face of the valve seat.

Aside from a few special features necessary to accomplish its particular purpose, the machine is similar in construction to the regular No. 4 Brown & Sharpe universal grinding machine. By removing the raising blocks from under the headstock and footstock, changing the size of the grinding wheel and its guard, and making slight additions to the equipment, the machine can be converted into the No. 4 universal grinding machine. The machine swings 22¾ in. in diameter, 15½ in. over the water guards, and takes 60 in. in length.

The tool steel wheel spindle has hardened bearings, ground and lapped, and running in self-aligning, phosphor-bronze boxes provided with means of compensation for wear. The spindle and boxes can be easily removed

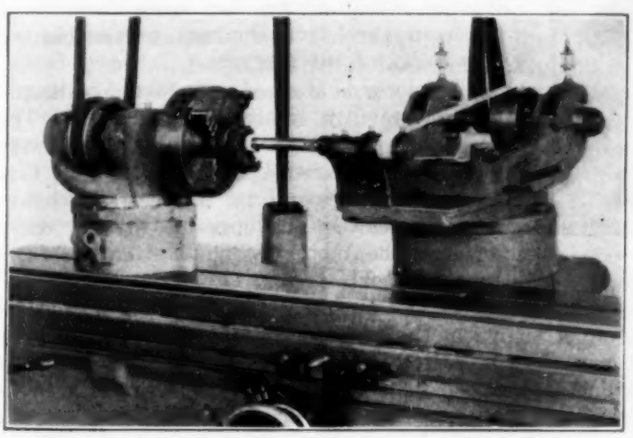


FIG. 3. INTERNAL GRINDING FIXTURES FOR B. & S. NO. 4 MACHINE

to make room for the internal grinding attachment. The automatic crossfeed will move the wheel from 0.00025 to 0.004 in. at each reversal of the table, as desired. It is automatically disengaged when the work is ground to size. The table travel is automatic and is controlled by easily adjustable dogs.

The speeds and feeds of the wheel and work and table are entirely independent of each other. A single lever starts and stops the rotation of the work and the feed of the table. The table reversing mechanism is very accurate, allowing work to be ground close to a shoulder.

The base of the machine rests on the floor at three points. This construction maintains the alignment of the table, and prevents it from being affected by any inaccuracies of the flooring. The box-like construction of the frame with the ample overhang at each end gives firm support for the table, especially at the end of its traverse. Strong ribbing extending the entire length of the table keeps it rigid and prevents it from sagging.

The grinding wheel is 24 in. in diameter, 1 in. thick, and has a 5-in. hole. It is protected by a heavy guard, which helps to confine the spray and particles of abrasive. The footstock carries the holder for the carbon point, and the wheel can be trued without removing the work from the centers.

Included in the equipment are two universal adjustable backrests for supporting slender work or splined shafts. They automatically compensate for the decrease in diameter as the work approaches size. Their use is illustrated in Fig. 2. For wet grinding there is a supply of water furnished by a pump from a tank attached to the rear of the machine. This pump is of simple construction, delivers the water in a steady stream, and requires no packing or priming. The telescopic water guards protect the operator from spray.

The equipment shown in Fig. 1 is included with the machine. Fig. 3 shows the machine set up for internal grinding. The floor space required at right-angles to the spindle is 52 in., and parallel to the spindle 207 in. The hollow base is fitted as a closet to hold small tools and accessories.

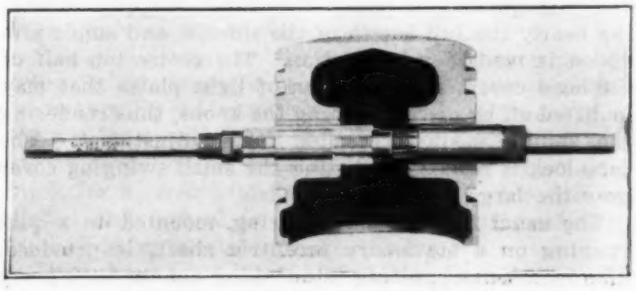
Alvord Piston-Pin Bushing Reamer

The illustration shows the "X-Cel" adjustable piston-pin bushing reamer with pilot, recently introduced by the Alvord Reamer and Tool Co., Millersburg, Pa. The cutter of this tool is very similar to the regular Alvord adjustable reamer and is adjusted in the same manner, but the shank and pilot stem are ground to an accurate sliding fit with the taper plug shown, and are parallel and concentric with the cutting edges.

By passing the pilot stem through the piston-pin bushings and then slipping the taper plug on the pilot and pressing it into the bushing, the reamer is centralized and supported and reams the bushings in correct alignment and with no chatter. With pistons of small diameter and correspondingly short pin lengths it is sometimes necessary to ream first one bushing, and then reverse the reamer and plug and ream the other bushing. In this case, the second reaming operation is centralized from the bushing already reamed.

This too is simple to operate as there is no adjustment necessary on the taper plug, which fact materially decreases the time necessary to fit a set of pins. The taper of the plug is sufficient to cover the range of adjustment of the reamer, but is gradual enough to align the reamer in place.

The reamers are made in eight different sizes, and cover a range from ⅝ to 1⅝ in. A special set designated as Set No. 503, has been assembled which con-



ALVORD PISTON-PIN BUSHING REAMER

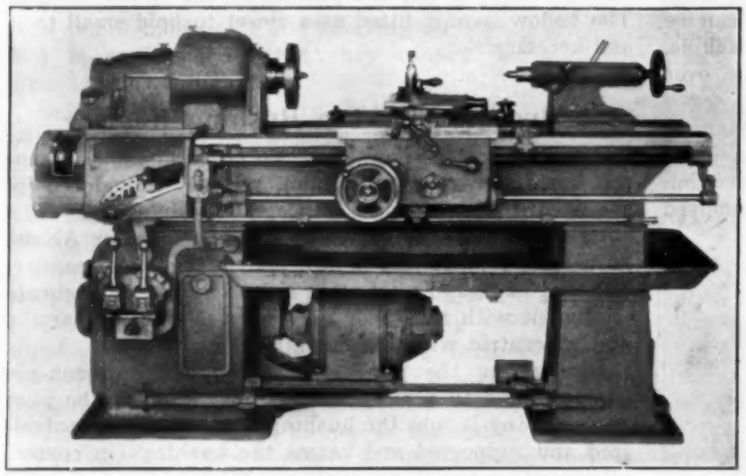
sists of four reamers and which will ream standard and oversize holes for practically all of the leading cars on the market.

Hendey 14-In. Toolroom Lathe

The Hendey Machine Co., Torrington, Conn., has placed on the market recently a motor-driven toolroom lathe that embodies some noteworthy features.

A departure from customary practice is the mounting of the motor on a shelf beneath the oil pan, where it cannot obstruct light or interfere with the vision of the operator. The motor drives the speed-box through an Oldham coupling having no screws or bolts, and may therefore be removed or replaced without preliminaries other than withdrawing the holding-down bolts and disconnecting the wires. The motor pinion, being supported by independent bearings, remains in place in mesh with the second gear.

Within the pedestal an oil-tight change-gear box is so mounted as to swing about the center of the second shaft, and from a pulley on the exterior of this box a belt goes directly to the single driving pulley on the spindle. The weight of the gear box maintains a constant tension on the belt, thus eliminating trouble from stretching of the belt and danger of breakage from possible snagging of the tool in the cut.



HENDEY 14-IN. TOOLROOM LATHE

Nine changes of speed are available by means of the gear box, and are controlled by the position of the two levers on the front of the pedestal. A positive interlock prevents interference of the gears. An easily removable cover on the front of the pedestal gives access to the gear box, while by removing the end plate and disconnecting the control levers, the entire gear box and attached mechanism may be removed without interference with other parts.

The single driving pulley is mounted on a quill extending nearly the full length of the spindle, and ample provision is made for lubrication. The entire top half of the head cover is in the form of light plates that may be lifted off by merely turning the knobs, thus rendering the spindle easily accessible for readjustment. The cone lock is reached by lifting the small swinging cover over the large gear.

The usual form of back gearing, mounted on a quill running on a stationary eccentric shaft, is provided. The operation of putting in or taking out the back gears is performed in the same manner as in the older form of Hendey lathe. The ratio of the back gearing is such that nine additional speeds are available, making eighteen in all.

A complete range of threads and feeds is provided by the two gear boxes controlled by the two upper levers. The small lever on the circular dial at the left of the headstock slides the idler gear into or out of mesh, so that the spindle may be run at high speeds without running the gears.

The spindle conforms to the usual Hendey design, running on tapered bearings that are easily adjustable to compensate for wear. A different method of sustaining the end thrust is introduced, which distributes the load over ample wearing surfaces and makes adjustment easily and quickly possible.

Improvements in the design of the carriage and crossslide add rigidity and convenience. The ratio between crossfeed and carriage traverse is carefully calculated and intended to give accurate tapers or bevels when the two are used together. In conjunction with the taper attachment, an extremely wide range of tapers is available. The tail spindle is graduated and the footstock provided with an improved form of locking device.

Every moving part except the spindle nose and the lead screw is completely covered, thus minimizing the possibility of accident. The lead screw is provided with the usual reversing lever in the apron, and with a positive knockout in either direction to be used when turning between shoulders. Closing the locknut on the lead screw disconnects the hand wheel from the rack, preventing the possibility of interference.

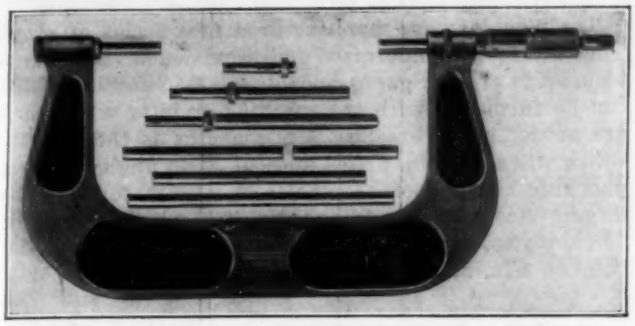
The motor is stopped and started by means of conveniently located pushbuttons. The speed change levers are interlocked with the electric control mechanism, so that the first movement in the act of changing the gear speeds operates to slow down or stop the motor without attention from the operator.

The treadle extending along the front of the base is connected with the swinging gear box so that the operator can, by the pressure of his foot, stop the lathe for the purpose of calipering or inspecting the work without stopping the motor. Depressing the treadle raises the gear box and releases the tension of the belt. The operator is thus enabled to stop the lathe from the extreme end without the necessity for reaching the control buttons. In its lower position the weight of the gear box rests partly on the belt and partly on an adjusting screw, so that the belt tension may be adjusted as the nature of the work may require.

Brown & Sharpe No. 55 Micrometer Caliper

The Brown & Sharpe Manufacturing Co., Providence, R. I., has recently increased the range of its No. 55 micrometer caliper. By means of the four detachable anvils, shown in the illustration, the tool can be adapted to measurements from 2 to 6 in., instead of from 3 to 6 in. as formerly. The anvils can be quickly changed and held securely in place by a knurled nut. One anvil is for measurements from 2 to 3 in., another from 3 to 4 in., and so on.

The tool is especially useful in garages and service stations where small pistons, many under 3 in. in diameter, and also large pistons for trucks and tractors, require accurate measurement. It can measure all



BROWN & SHARPE NO. 55 MICROMETER CALIPER

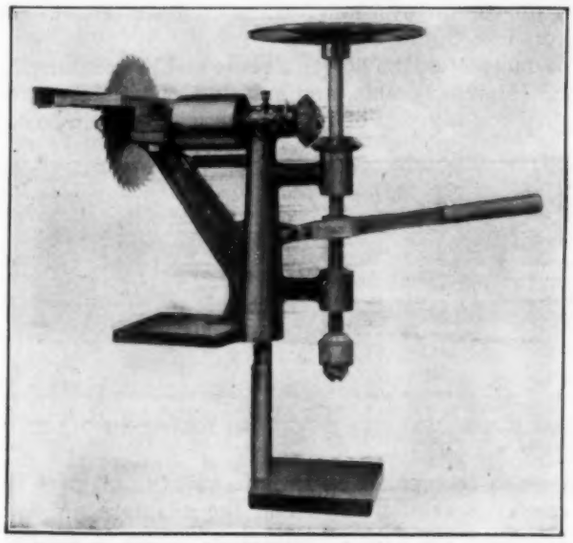
ordinary sizes of pistons and cover the same range of work as three or four ordinary micrometers. In general construction it is similar to other Brown & Sharpe micrometer calipers.

Reeves Combination Bench Machine

The Ster-O-Lock Manufacturing Co., 417 So. Dearborn St., Chicago, Ill., has recently developed the machine shown in the illustration, which is known as the Reeves machine. This machine is a combination tool intended for use in the garage or service station. It is adapted to mounting on a bench.

By employing the various attachments that are supplied, the machine can be used for drilling either wood or metal, for surfacing or sanding, disk grinding, polishing, buffing, rough or tool grinding, or for rip-sawing wood. The table through which the rip-saw protrudes can be removed in order to allow the various attachments to be adjusted, or the table can be tilted, for sawing at an angle. The horizontal disk at the upper end of the spindle is intended to be used for disk grinding or surfacing.

The frame of the machine is cast in one piece, and the spindles are of high-grade carbon steel. The horizontal spindle is connected with the vertical spindle through a positive steel clutch, which can be disengaged when using the horizontal spindle only. Both spindles run in bronze bearings. The vertical spindle has a range of 3½ in. without adjustment, and is supplied with a Jacobs chuck that will take drills up to ⅝ in. The drilling table is adjustable in position.

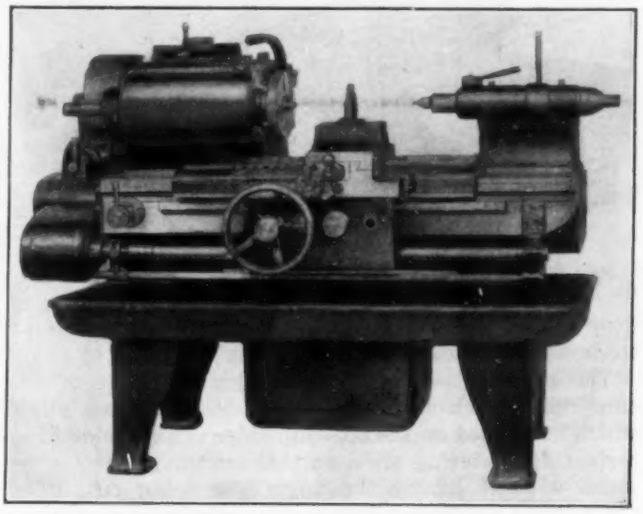


REEVES COMBINATION BENCH MACHINE

Sundstrand 12-In. Manufacturing Lathe

The Rockford Tool Co., Harrison and Eleventh Sts., Rockford, Ill., has recently placed on the market the 12-in. Sundstrand manufacturing lathe shown in the accompanying illustration. The machine is constructed on the same general principle as the 9-in. Sundstrand lathe described on page 1028, Vol. 48, of AMERICAN MACHINIST, with the exception of its greater swing and combining features necessary for a machine of larger range and capacity. In the design of this lathe special attention has been given to obtaining a compact and rigid machine, capable of standing up to the demands of specialized production, yet flexible enough to be used for a great variety of work. It is equipped with cross-feed, quick-change feed and reverse to the carriage, and is adaptable to thread cutting by substituting a lead screw in place of the feed rod.

The headstock gives nine speeds selective. The drive is of the single-pulley type, with a friction clutch in the large driving pulley. The same movement that disengages the clutch automatically applies a brake, which stops the spindle instantly. For attaching air cylinders, draw-in attachments and expansion chucking devices, an extension is provided at the outer end of the spindle.



SUNDSTRAND 12-IN. MANUFACTURING LATHE

Specifications—Swing: over carriage, 12 in.; over cross-slide, 10 in. Distance between centers, 18 in. Hole through spindle, 1⅛ in. Diameter of drive pulley, 12 in. Width of drive belt, 4 in. Speed of drive pulley, 200 r.p.m. Number of feeds, 29. Number of spindle speeds, 9. Toolbit, ⅜ x 1¼ in. Floor space, 35 x 70 in. Weight: net, 3,130 lb.; domestic shipping, 3,330 lb.; export shipping, 3,500 lb.

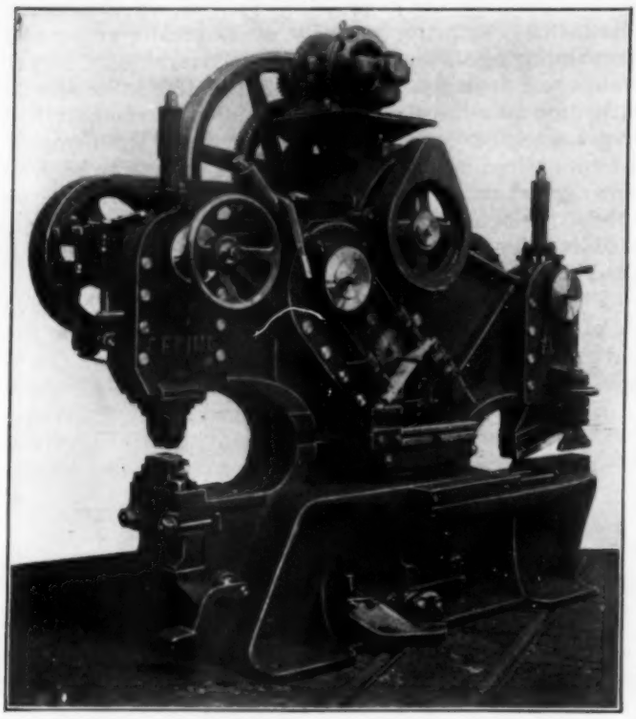
The main spindle taper bearings are made of bronze bearing metal, adjustable for wear.

A special feature on the carriage is the multiple-stop collar, which makes a positive stop for the cross-slide when turning shafts with shoulders and different diameters. The carriage, which has exceptionally long bearing surfaces on the ways and is arranged with a slide block for a taper attachment, has lugs on top that are drilled and tapped to permit the mounting of extra cross-slides or special toolholder blocks.

The apron is of the double-wall type, with a minimum number of working parts and gears. A simple feed reverse box, of bevel-gear and clutch type and having steel gears and bronze shaft bearings, is regularly furnished. A quick-acting tailstock is supplied as standard equipment. Taper attachment, draw-in attachment and rear toolblocks can be furnished.

Oeking Triple Combination Punching and Shearing Machine

The combination punching and shearing machine shown in the accompanying illustration has recently been placed on the market by Amplex, Inc., 6 West 32nd



OEKING PUNCHING AND SHEARING MACHINE

Street, New York, N. Y. The machine is economical in floor space, and can be adapted to different types of work without the necessity of changing tools.

The operator's side of the machine is clear of encumbrances such as flywheels and driving gears, all of which are placed on the opposite side. The machine has a slanting centering slide, so that mitering cuts can be made without lifting the angle bar being cut. The plate shear has longer knives than employed in former models of the shearing machine. The lengths are for the No. 16 machine, 13 in., and for the No. 20 machine, 16 in., against former lengths of 9 and 11 in., respectively. There is ample room behind the knives to avoid binding the plates being cut.

The punch is arranged for punching both webs and flanges of structural shapes, and the height of the throat is designed for handling broad flanged Bethlehem shapes. The punch is provided with lowering devices to ascertain the center mark before punching, and both hand and foot levers are provided to throw the machine into gear. The springs as well as the gears are enclosed, so as to safeguard the operator. The bar and angle cutter cuts any structural shape, but the standard equipment provides for cutting rounds, squares, angles and tees only. The knives can easily be exchanged for cutting beams and channels.

The machine is constructed so as to provide durability. The frame is cast steel. The slides are also made of steel and are adjustable. The covers of the slides are attached to the body by pin bolts, so that they cannot work loose. The bearings have large surfaces; they are bronzed bushed and provided with ring lubrication.

The machines are manufactured in a series of sizes. They are fully standardized and provision has been made to provide cranes, gages and other attachments, which can be furnished with the machine or later when they are needed. The smallest size machine is the No. 13, which will split $\frac{1}{2}$-in. plates and cut $3\frac{1}{2}$-in angles, with a punching capacity of $\frac{7}{8}$-in. holes in $\frac{1}{2}$-in. material. The largest size machine is the No. 32, which will split $1\frac{1}{4}$-in. plates, cut 8 x 8 x $\frac{3}{4}$-in. angles and punch $1\frac{3}{4}$-in. holes in 1-in. material.

Marvin & Casler Reamer Holder

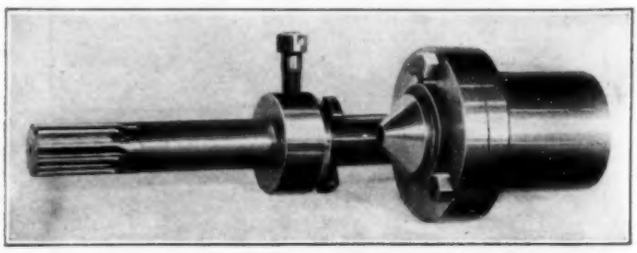
The Marvin & Casler Co., Canastota, N. Y., has recently placed on the market the equipment shown in the accompanying illustration for holding reamers on screw machines or lathes. The holder is not intended to float, but operates on a different principle. In order to ream a straight, true hole it is assumed necessary to hold the rear end of the reamer in line with both the center line of the machine spindle and of the hole to be reamed.

The bushing or adapter sleeve shown at the right of the illustration is suitably mounted on the turret of the lathe on which the holder is employed. The faceplate on the front of the bushing is held by three capscrews. With this equipment on the turret, the work is first bored, then faced a short distance from the hole and the corner chamfered so as to provide the proper bearing for a tapered plug.

The cone-shaped centering plug is placed in the faceplate of the holder and the turret is moved toward the work. As soon as this cone plug enters the bored hole, it brings the faceplate concentric with the spindle of the lathe. While the plug is held tightly against the work, the capscrews are tightened so as to secure the faceplate.

The turret is then backed away, the cone plug removed and the reamer holding sleeve inserted in its place. This sleeve maintains the reamer securely in position and insures that its rear end will be in line with the center line of the work and of the machine spindle. The reamer holder can be disengaged in order to fit it to other reamers. Ordinarily the entire reamer may be passed through the adapter sleeve, so that only that portion of the reamer necessary to make the cut is required to overhang. The reamer shank thus projects into the turret.

The faceplates, the holder sleeves and the center plugs are all interchangeable, and only one plug is ordinarily required for a group of machines. The reamer holding



MARVIN & CASLER CENTERING REAMER HOLDER

sleeves can be supplied in sizes to suit the reamers that are used. Special fittings and the adapters necessary for attaching the holder to different makes of machines can be provided.

Lassiter-Millholland Staybolt Machines

The Dale Machinery Co., Inc., New York, N. Y., has recently placed on the market two horizontal staybolt machines. The machines are manufactured by the Millholland Machine Co., Indianapolis, Ind., and are known as the Style A and Style B, Lassiter-Millholland staybolt machines. The Style B machine, illustrated in Fig. 1, is used for turning simultaneously the taper and straight diameters on radial, button-head and crown staybolt forgings, and for threading both the straight and taper ends, also simultaneously, in uniform pitch and continuous lead.

For turning, the bolt is gripped in a collet with special collet bushings and adjustable stop. The turning feed is then engaged by means of a friction, which is driven by a spline in the feed shaft, and the two Modern turning heads are fed over the portion of bolt to be turned, thus machining both ends at the same time, the chasers in the dieheads having been replaced with cutters, so that the tool acts as a hollow mill. The front head has a taper attachment which can be adjusted to any desired taper. This attachment allows the front diehead to open gradually as the slide moves forward. The cutters in the rear diehead are straight, and those of the front head tapered. Both dieheads are automatically tripped at the end of the cut, and are automatically closed by adjustable cams mounted on a slotted bar on the rear of the machine.

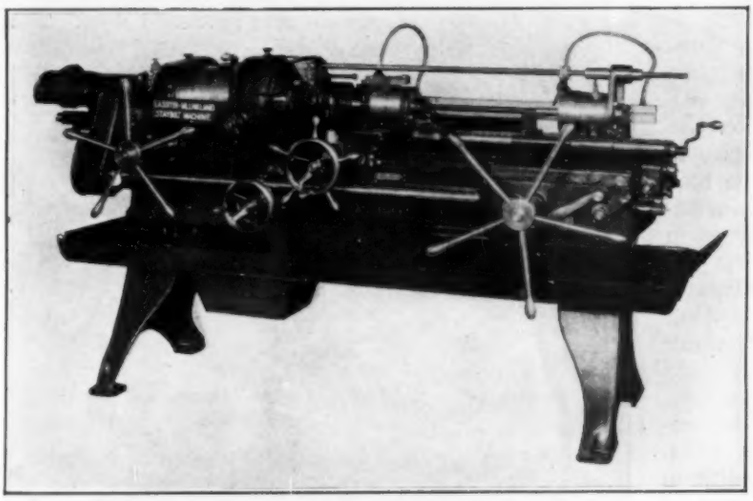


FIG. 1. MODEL B LASSITER-MILLHOLLAND STAYBOLT MACHINE

For threading, the cutters in both heads are replaced with chasers. The heads being closed, the threading feed is engaged by closing two half nuts on the lead screw, which feeds the dieheads at the desired pitch and does not allow creeping or lagging. As the dieheads are held in constant relation on the slide, a bolt of continuous lead and uniform pitch is the result.

To enable the machine to be adjusted to any desired length within its range, the rear diehead carrier is adjustable on the slide by means of a fine-pitch screw. A permanent spacer bar very accurately made is furnished with each machine. This bar has twenty-three holes accurately bored and spaced 1 in. apart, to correspond with the various lengths of bolts. The rear diehead carrier has a pin which when inserted through any of the holes in the bar sets the dieheads in continuous lead without further adjustment.

A cross slide with hand crossfeed and hand longitudinal adjustment is provided for facing and undercutting the button-head bolts. The machine has a capacity for bolts from ¾ to 1¼ in. in diameter and 14 to 36 in. long. It is supplied in cone-driven or geared-head design, the latter arranged for single-pulley or motor drive. Seven hundred bolts 28 in. long per day of nine hours have been completed by one operator.

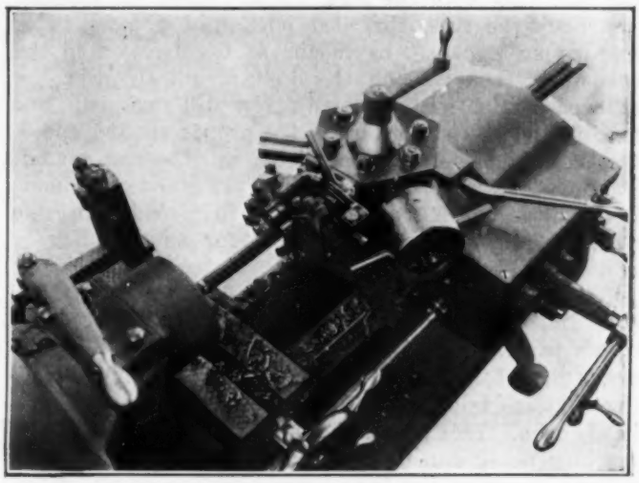


FIG. 2. BOX MILL IN POSITION ON MODEL A LASSITER-MILLHOLLAND STAYBOLT MACHINE

The Style A machine is used to make side stays from the bar of either iron or copper. This machine turns the relieved portion in the center of the bolt and threads both ends in uniform pitch and continuous lead. The machine is rigidly built and is provided with a special feed-box apron, and splined lead screw.

A hexagonal turret is mounted on a slide, which moves directly on the ways of the machine, no saddle being used. Taper gibs are provided where necessary to compensate for wear. A double-plate apron is attached to the slide.

The stock is fed through the spindle and automatic chuck bar by the bar feed, up to a

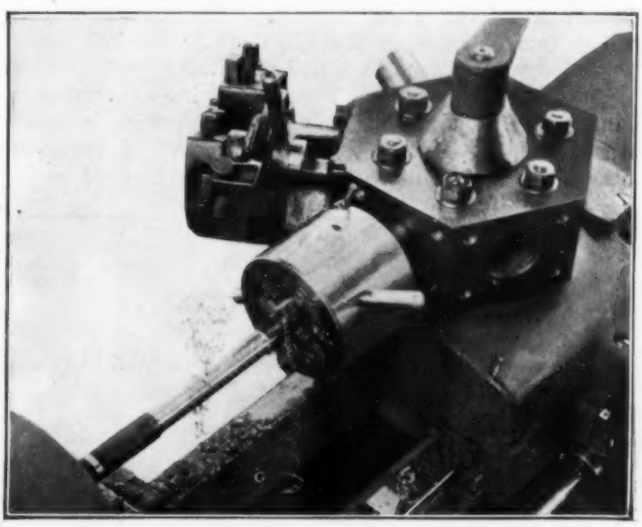


FIG. 3. DIEHEAD IN POSITION

stockstop mounted in the turret. The center portion is then relieved by a box mill of special design, as shown in Fig. 2. The box mill being withdrawn, the diehead indexes into position and is fed onto the work by engaging the half nuts with the lead screw. When the diehead completes the first threaded portion, the machine is speeded up instantly by means of the friction in the headstock, thus passing the diehead quickly over the relieved portion with the lead screw still engaged. The machine is then slowed up to the proper cutting speed, the threading operation completed and the bolt cut off. This produces a bolt with uniform pitch and continuous lead. The Style A machine also is furnished with cone drive or a geared head arranged for single-pulley or motor drive.

In both styles of machines both the turning and threading feeds are automatically tripped. The friction clutch which is used for turning is automatically disengaged, and the half nuts which are used during threading also are tripped at the same instant that the dieheads open. This guards against any possibility of the machine being damaged, should the operator not be in attendance when the threading operation is completed.

A safety device is supplied which allows only one feed to be engaged at a time, and it is impossible to engage both the friction and half nuts at the same time. Modern dieheads are used on both machines.

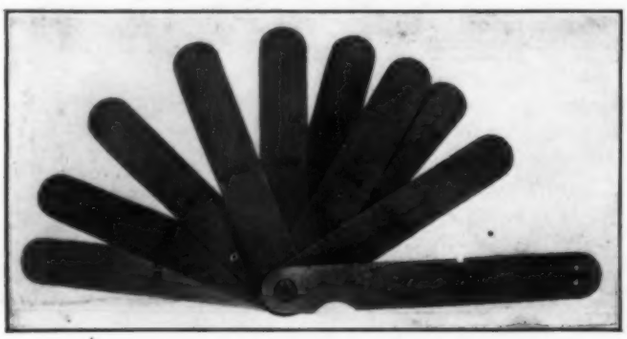
Lufkin Thickness Gage With Lock

A thickness or feeler gage recently placed on the market by the Lufkin Rule Co., Saginaw, Mich., is provided with a lock by which the blades may be held in any position. This lock consists merely of a knurled-head nut that clamps the leaves tightly together when it is turned a fraction of a revolution.

The gage is adapted particularly to the use of automobile mechanics and repair men. When making adjustments of tappets on motors, the proper leaf can be used at the full length of the tool of 5½ in. In this way, fits can be gaged in places difficult of access.

The gage is made in several styles. The No. 06 carries six leaves having thicknesses of 0.002, 0.003, 0.004, 0.008, 0.010 and 0.015 in. The No. 07 has in addition a 0.0015-in. leaf. The No. 09 has nine leaves 0.0015 to 0.015 in. in thickness. The 0.015 leaf and the nameplate form the case, so that the thinner leaves are well protected when the gage is closed. The No. 109 tool, which is illustrated, is the same as the No. 09, but is provided with a case in which the blades fold.

On all of the gages, the leaves are ½ in. wide and 3 in. long. The removal and insertion of blades is easily accomplished. If two leaves are separated from the others and locked in position, they may be used as the upper and lower limits that are permissible in the fit. The leaves are accurately ground to size, which is marked on each. When the gage is closed and locked, the blades are protected.



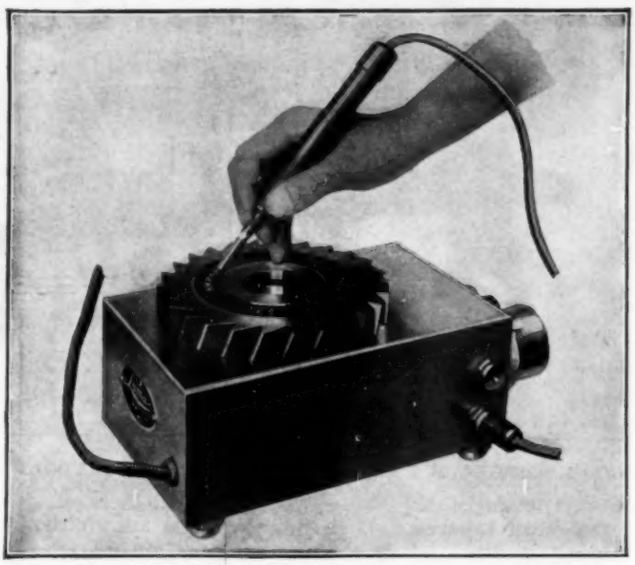
LUFKIN THICKNESS GAGE WITH LOCK

Luma Electric Etching Pencil Outfit

The Luma Electric Equipment Co., 405 Spitzer Bldg., Toledo, Ohio, has recently placed on the market the electric etching pencil outfit shown in use in the accompanying illustration. The device consists of two major units, a magnetic table, and the pencil itself. It is adaptable to several uses, the chief of which are etching or writing on hardened steel, demagnetizing steel, annealing and soldering.

By using the magnetic table of the device, work that has been placed on a magnetic chuck can be easily demagnetized. It is merely necessary to pass the piece across the table while the current is turned on, to accomplish this result. Similarly, tools or bars may be magnetized. A file or scribe may thus be employed for removing chips from holes, or for holding small screws and such work in place. It is merely necessary to lay the tool on the table, turn on the switch, then turn off the current and remove the part.

The etching pencil permits of marking sizes, numbers and such inscriptions on tools and hardened steel. The



LUMA ELECTRIC ETCHING PENCIL OUTFIT

cord of the etching pencil is attached to the table, on which the tool to be marked is laid. When the current is turned on, it is possible to mark the work, with no more pressure than required for ordinary writing.

When used as an annealing point, the cord of the pencil is attached to the top connection on the side of the instrument. The point is then replaced by one made of carbon, and the work is placed on the table of the instrument. When the current is turned on and the carbon point held on the work, the point of contact begins to glow with heat. In this way, a small spot can be heated without affecting the rest of the work.

The carbon point may be employed in the same manner for soldering, being held in contact with the work to heat it and cause the solder to flow. The outfit is operated from an ordinary lighting circuit of 110-volt, 60-cycle, alternating current.

American Foundry Equipment Co. Power Sand-Cutting Machine

The accompanying illustration shows a machine for use in foundries for cutting and tempering sand. It has recently been placed on the market by the American

"AMERICAN" TYPE HP SAND-CUTTING MACHINE

Foundry Equipment Co., 336 Madison Ave., New York, N. Y., and is similar in general construction to the machine described on page 779, Vol. 55, of AMERICAN MACHINIST. The recent model of the machine is equipped with an electric motor for moving it by power, and is designated as the Type HP machine.

The frame is made of seamless steel tubing. The front wheels are of the caster type and mounted on inclined forks. The machine is steered in the same manner as a push cart. Spring mounting of the wheels enables compensation for unevenness in the floor. The drive wheels are of the tractor type, and are driven by a motor through gearing that engages with each wheel. The motor may be run in either direction and has two speeds, the fast one affording a travel of 45 ft. per minute and the slow one of 15 ft. per minute.

The cutting cylinder, shield, motor and transmission are carried upon a frame held in approximate balance. By tilting this frame, the cutting cylinder can be lowered into the sand. This operation is normally performed by means of the handwheel at the front of the machine, although the cylinder may be quickly raised independently of the wheel in case of emergency. The cutting cylinder is driven by a 2-hp. motor. Current is brought to the motors through a flexible cable that may be attached to any convenient plug.

The machine may be employed for mixing core sand and facing sand, as well as molding sand. It performs the entire work of blending, mixing and tempering without the aid of any accessory mechanism, and may be employed to pile the sand or throw it into windrows. The total length of the machine is 91 in., and the width 63 in. The clearance above the floor is 22 in. and that between the wheels 55 in. The length of the cutting cylinder is 44 in. Weight, 1,500 pounds.

Wayne Portable Oil-Burning Forging and Rivet-Heating Furnace

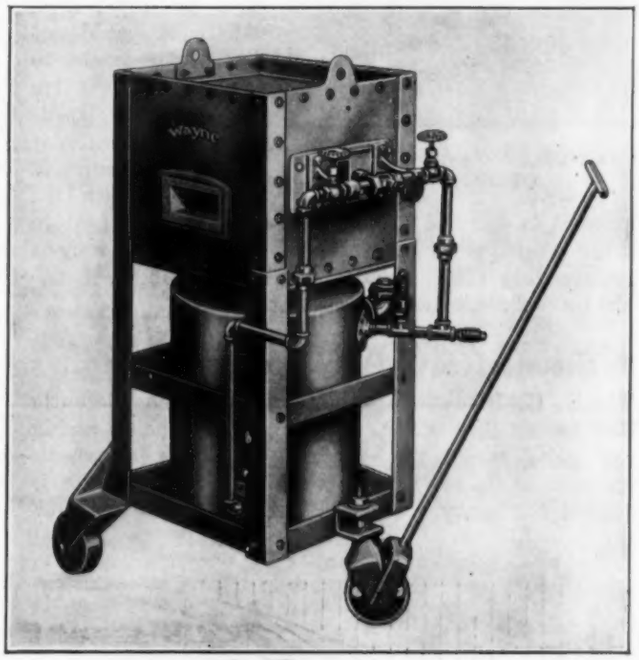
The portable oil-burning forging and welding furnace shown in the illustration has recently been developed by the Wayne Oil Tank and Pump Co., Ft. Wayne, Ind., for shops where it is necessary that the forging or rivet-heating equipment be moved about in order that the work may be more speedily and easily accomplished. The furnace is substantially but lightly made.

The furnace is approximately 51 in. high over-all, 25 in. from front to back, and 31 in. wide. The handle is 40 in. long and attached to the guiding castor. The furnace body is made of 14-gage black iron, held by heavy angles, and is 16 in. high, 18 in. wide and 16½ in. from front to back. The work opening is 6 in. wide, 3 in. high at the edges and 4 in. high in the center. The working space is 9 in. wide and 7 in. deep, exclusive of the tile opening, which is 5¾ in. from front to back.

The supporting frame which surrounds the tank is made of heavy angles. The tank itself, which is flame welded, is constructed of black iron with a $\frac{3}{16}$-in. shell and ¼-in. heads. The tank will withstand a working pressure of 100 lb. per square inch. It is 17 in. in diameter and 22 in. long, and has a capacity for 14 gal. of fuel, which is sufficient for 10 hr. of normal operation. The tank is fitted with a safety valve. The 2-in. air-tight filling opening is conveniently located.

The parts of the heater are conveniently arranged, with but few wearing parts to require replacement. Other than the fire-clay combustion chamber there is practically nothing that must be renewed as a result of usage. The fire-clay shapes are simple and may be quickly renewed.

Air pressure is obtained by connecting the furnace to the compressed-air line which supplies the riveting



WAYNE PORTABLE OIL-BURNING FURNACE

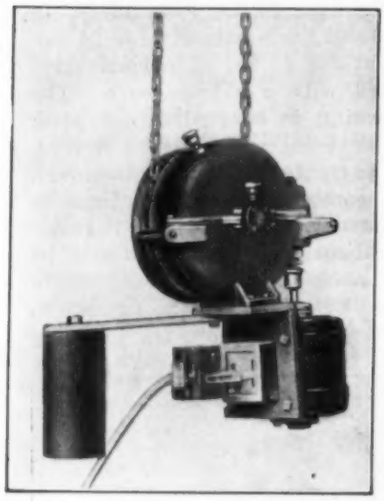
hammers. After the burner has been once adjusted to the air pressure used, it will require practically no further attention. The shipping weight of the furnace is 600 lb.

New Jersey Foundry and Machine Co. "Handiman"

The device shown in the accompanying illustration has recently been placed on the market by the New Jersey Foundry and Machine Co., New York, N. Y., for operating hand-power hoists of 5-ton or larger capacity. It is an electrically driven machine that may be suspended in the bight of the operating chain. It has a capacity to overhaul 138 ft. of chain per minute, with a chain pull of 150 lb., thus overhauling the chain about four times as fast as a man can do it.

The machine consists of a cast-iron housing in which is contained a hardened worm and worm gear running in oil and driven by a ¾-hp. motor attached to the frame. The worm-wheel shaft carries a grooved sheave with a rubber tread. This tread is V-shaped, will fit any size and pitch of operating chain and gives sufficient tractive effort to prevent slipping. The machine is counter-balanced, so that it hangs with the center of gravity in the plane of the operating chain.

Current may be supplied by a flexible conductor from a convenient lamp socket. Mounted on the machine is a plug socket for attaching the flexible conductor, and a reversing switch that enables the motor to be run in either direction.



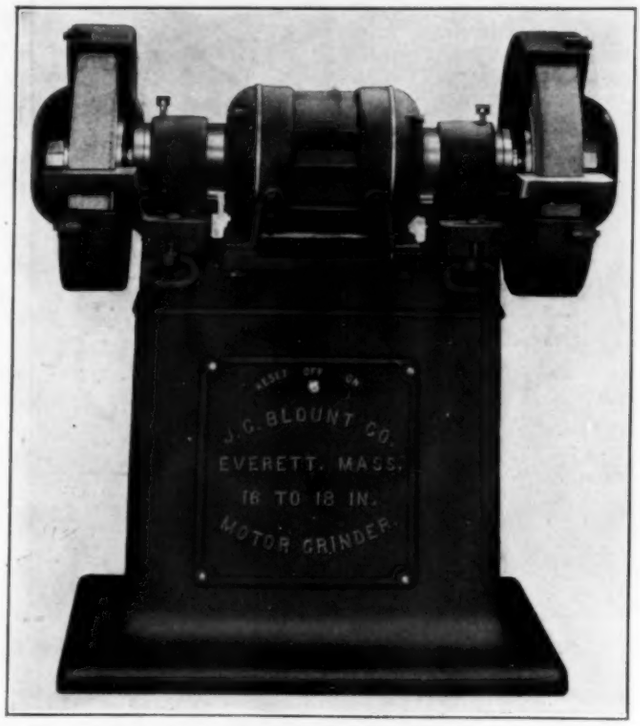
"HANDIMAN" CHAIN-HOIST OPERATOR

The machine is intended for use on hand-operated equipment where it is desired to obtain faster and easier operation than is obtainable by hand, and where it would not be worth while to install an electric hoist. The "Handiman" is not a hoist itself, but simply a portable machine that may be carried from place to place and used to operate a number of hand hoists. The machine weighs approximately 165 lb., which is in excess of the hand-chain pull of most hand-operated hoists.

Blount Heavy-Duty Motor Grinder

The J. G. Blount Co., Everett, Mass., has recently added to its line of alternating current ball bearing motor grinders a 5-hp. heavy-duty machine for wheels 18 x 3 x 1½ in. or 16 x 3 x 1½ in. The machine is designed for heavy work and built accordingly. SKF bearings are used throughout and the spindle is of 45-point carbon steel.

The end shields are of cast iron, turned with a recess and bolted directly to the motor frame. They are further secured in position by supports clamped around the end shield hub and then bolted to each side of the head



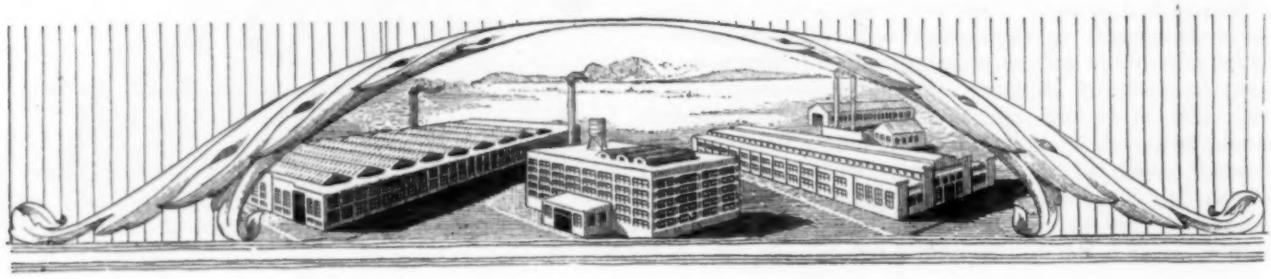
BLOUNT HEAVY-DUTY GRINDER

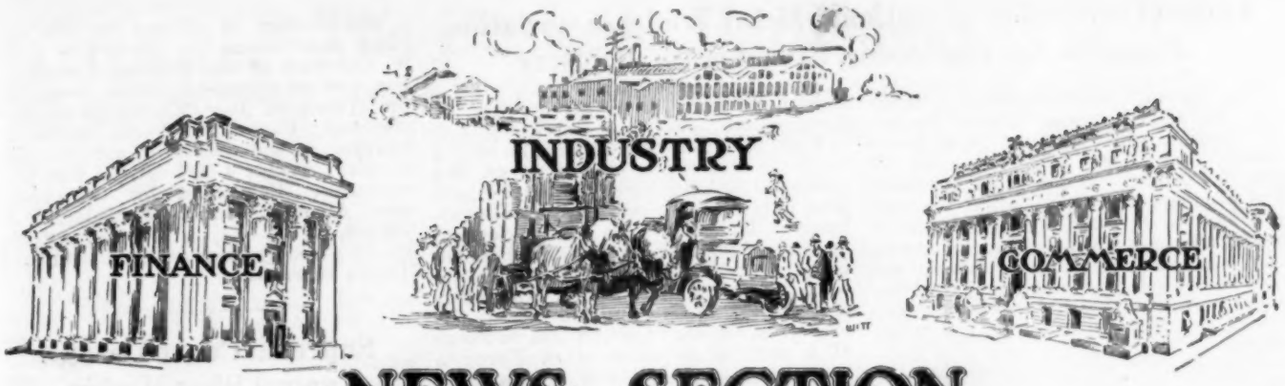
casting. The end shield flanges are turned and threaded into the ends of the shields. The flanges are machined all over and recessed on the inside.

Wheel guards are furnished, either plain or of the exhaust type, and are adjustable. Removable covers enclose the sides of wheels, flanges, nuts, etc., for safety protection. The work supports are so mounted that their positions are adjustable.

The starting switch is a Westinghouse No. 815 safety type, mounted within the column on a separate panel, and easily removable from the rear of the machine, without disconnecting the switch. The switch protects both operator and equipment against unexpected restarting and accidental starting of the motor. It cannot be held closed on overload and has a long life under severe operating conditions.

The machine is furnished as follows: 5-hp., 220 or 440 volts, 60 cycle, 2 or 3 phase, or 550 volts, 60 cycle, 3 phase. The weight of this machine is about 1,200 pounds.





NEWS SECTION

Mechanical Engineers at Atlanta Next Month

The spring meeting of the American Society of Mechanical Engineers will be held in Atlanta, Ga., from May 8 to 11, with headquarters at the Piedmont Hotel. The technical program is said to be one of the best ever prepared for such a meeting. Seven of the sessions have been planned by the professional divisions of the society, these sessions to be held on the mornings of each of the convention days.

The textile division and the machine shop practice division have co-operated in two sessions which will deal with textile machinery. The materials handling division will present a paper on material handling equipment as used in the iron and steel industry. This paper will give the results of an intensive study of this subject by a special committee, and will furnish a remarkable opportunity for the discussion of the best methods for handling the many materials used in the steel industry. There will also be sessions on fuels, management, power, welding, and two interesting general sessions. A valuable paper on turning exhaust losses into work in reciprocating engines has been prepared by Dr. Johann Stumpf, who will present it in person. A public hearing will be held on the power test codes, at which a discussion on definitions and values, displacement compressors and blowers will be permitted. The boiler code committee will also hold a meeting.

The usual entertainment features of the spring convention will afford the delegates plenty to do in their leisure moments. Special provisions have been made to entertain the ladies while the men are attending the meetings.

Tap Drill Sizes

Recently a meeting of the National Screw Thread Commission was held at the Bureau of Standards, Washington, D. C., at which consideration was given to the question of tap drill sizes to be recommended for producing holes in conformity with standards adopted by the commission. It was voted to recommend drills of a diameter midway between the maximum and minimum minor diameters of the tapped holes already established. These limits result in a thread in the nut of from 75 to 83⅓ per cent full depth, with a mean value of 79⅓ per cent full thread depth.

Department of Commerce Not to Aid Open-Price Associations

Trade association practices that come under any suspicion whatever constitute such a small percentage of the benefits accruing from the work of these organizations, that there is no justification for the continuance of questionable activities. This point was brought out strongly at the Trade Associations Conference held at the Department of Commerce on April 12. It was shown that only seventy out of 3,000 organizations can be classed as open-price associations. Even among the open-price associations the opinion was expressed that 90 per cent of the benefits to members come from other activities and that these benefits are greatly exaggerated.

While it was brought out clearly at the meeting that the legality of open-price statistics has not been passed upon, and that associations doing such work cannot be denounced as law breakers, particularly when their figures are made public, yet it was made perfectly plain that the Department of Commerce will not co-operate with that type of organization. No one will be surprised if the Department of Justice should institute proceedings against such associations. At any rate, the Department of Commerce is not going to jeopardize its usefulness to other trade associations by co-operating with those who are operating within the twilight zone.

The Department of Commerce has on file a long list of the constructive things which trade associations can do. The list is growing. It is believed that its growth will be accelerated as trade associations realize that they have been covering only a portion of their field. Heretofore, attention has been concentrated largely on matters intended to accelerate production. Very little has been done toward improvement in distribution—an area thought to promise much. Sight also seems to have been lost of the fact that no restraint of trade is involved when buyers and sellers get together. Were trade associations to arrange for committees of buyers to confer with committees of sellers, it is believed that much waste could be eliminated and the spread between the price obtained by the producer and that paid by the ultimate consumer could be narrowed materially.

Trade Excursion to Mexico for Business Men

Business men who are interested in the future development of our trade with Mexico, are being offered an excellent chance to study that subject through a personally conducted tour of the Southern republic under the auspices of the *New York Commercial*. The excursion will leave New York on May 7 and will return on June 2. Stops will be made en route at Atlanta, Ga., New Orleans, La., Houston and Brownsville, Tex.

In Mexico the party will visit all the important industrial centers, to inspect plants, public works, harbors and the oil fields. Extended stops will be made at Monterrey, Tampico, San Luis Potosi, Aguascalientes, Guadalajara, Lake Chapala, Cuernavaca and Puebla.

The expedition will be accompanied by Dr. W. E. Aughinbaugh, well-known authority on foreign trade, and John F. Barry, editor of "Commercial Mexico."

Farm Machinery and Tool Prices Decline

The average of prices for farm equipment was 1.6 per cent lower on Feb. 15, than on Jan. 15, according to a survey made by the United States Department of Agriculture. The decline since Feb. 15, 1921 is 20.2 per cent.

The declines for the month were most pronounced in the case of machinery and tools such as tractors, cream separators, harrows, lumber, mowers, scythes, and wheelbarrows.

Foreign Trade Convention

The revised program for the ninth annual convention of the National Foreign Trade Council, which is to be held in Philadelphia, May 10, 11 and 12, has been received. The group sessions will include topics on advertising, credits, price quoting, protection, exchange losses, ocean transportation and general European conditions. The main theme of the convention will be the financing of foreign trade and a study of the merchant marine problem. The speakers have been selected with great care from among export managers, credit managers, treasurers and advertising executives. The general sessions will be held in the Academy of Music and the group sessions in the Hotel Bellevue-Stratford.

Annual Convention of National Metal Trades Association Features Apprenticeship Program for Industry

The twenty-fourth annual convention of the National Metal Trades Association was held at the Hotel Astor, New York City, on April 19 and 20. About 300 delegates attended. The program for the technical sessions provided a variety of subject matter having an important bearing on industrial conditions of today. Probably the most noteworthy accomplishment of the convention was the presentation of the report on apprenticeship in the metal trades.

This report was prepared by the committee on industrial education, of the association, after an exhaustive and intelligent study of this subject which took them into all phases of the metal-working industry. The committee was headed by Harold C. Smith, president of the Illinois Tool Works. He was assisted by W. M. Taylor, president, Chandler & Taylor Co., and John C. Spence, of the Norton Company. Philip C. Molter, superintendent of the industrial education department of the association also assisted in this work. The report gives a thorough survey of the industrial educational courses provided by the metal-working industries in this country. The good points of each were combined into a comprehensive program of apprentice training, and it is the plan of the association to have this program adopted throughout the industry and in that way develop a standardized system of training which will have a beneficial effect on the industry as a whole. The plan was presented by the committee and discussed at some length, but no final action was taken at this meeting.

One of the most interesting and timely addresses of the whole convention was delivered at the Wednesday afternoon session by Harold G. Moulton, professor of political economy in the University of Chicago. His subject was "American Industry and the Stabilization of Europe." Prof. Moulton presented a study of European conditions and an analysis of their effect on the business of the United States. He dwelt at some length on the Genoa conference and explained what its hopes had been before the discovery of the treaty between Germany and Russia, and the probable effects which that treaty would have on the final outcome of the conference. He said that the signing of this treaty was proof of the suspicions of France that Germany was not conquered, and was a justification of her insistence in being guaranteed protection by the United States and Great Britain. He said that it was the German idea to beat the Allies to it in Russia in case the Genoa conference gets them nothing; that if the conference at Genoa was a failure it would mean a resumption of the race for military supremacy in Europe, and might eventually lead to another conflict such as we have just experienced. He declared that the British policy in handling the German reparations was fundamentally sound in principle, and that it was Great Britain's desire to restore the economic stability of both Germany and Russia. Germany is the economic pivot of continental Europe and has been the leader of the industrial growth on that side of the water. He blamed the industrial stagnation of British industry today on the loss of German markets.

Prof. Moulton then showed the effects of these European conditions on the economic stability of America. He said that our domestic markets were absolutely dependent on our foreign markets, and that we could expect no progress while international markets were disorganized. His audience showed no little surprise when the professor declared that he was in favor of a general cancellation of Europe's war debts to the United States. He said that this was the only way out of the industrial and political chaos of today. He gave three possible remedies for our present industrial ills; a readjustment of exchange rates, abolishment of the too numerous trade regulations and barriers, and a reconsideration of the reparations payments, with a possible cancellation of the war debts.

An interesting presentation of the agricultural situation was given by A. M. Loomis, of the Washington office of the National Grange, whose subject was "The Farmer as a Balance Wheel." Mr. Loomis explained the origin and the growth of the recent farmer movements in this country, including the agricultural bloc in Congress. He pleaded for a greater recognition of the farmer and his problems, and predicted a greater prosperity for the nation when this was brought about.

The banquet on Wednesday evening was well attended. The speakers were: Former United States Senator Charles Thomas, of Colorado; Dr. W. H. E. Faunce, president of Brown University; and Howard E. Coffin, of the Hudson Motor Car Co.

On Thursday only two papers were presented. L. F. Loree, president of the Delaware & Hudson Railroad, addressed the convention on "Relations of the Railroads with Their Patrons." In his remarks the speaker touched on some of the abuses in transportation which he said were helping to keep the railroads from attaining their highest efficiency. He said that 1921 was the worst year in the history of the railroads of the United States. During that year railroad business decreased 30 per cent below the previous year, which was a drop of 20 per cent more than during any other depression. But he predicted that this year business would pick up at least one-half of this loss, though even then it would still be less than other years.

The other address was delivered by E. L. Greever, of Tazewell, Va., who was counsel for the non-union coal operators of West Virginia during the "insurrection" of last September. Mr. Greever gave a first-hand and intimate story of the march of the organized miners on the non-union forces. He characterized this as a "treasonable insurrection" and declared that it was financed and promoted with the knowledge of the officials of the United Mine Workers of America. He decried against the methods used by the labor unions to exact obedience from the union miners, and said that the non-union fields of West Virginia were the greatest bulwark against the encroachment of union domination of the coal industry.

The election of officers for the ensuing year closed the convention. W. W. Coleman, of the Bucyrus Company, was elected president; J. B. Doan, of the American Tool Works, first vice-president; Paul C. DeWolfe, Brown & Sharpe, second vice-president; J. W. O'Leary, Arthur J. O'Leary & Son Co., treasurer. Councilors for two years are: Albert J. Ford, E. J. Miller, A. J. Gifford, J. D. Cox, Jr., W. R. Angell, Jos. F. Cooley, Harold C. Smith and Harold Edwards.

Supreme Court Decides Against Shoe Machinery Company

The Government has won its case against the United Shoe Machinery Corporation. In the Supreme Court on April 17 Justice Day delivered the judgment of the court that the leases executed by that company with users of the machinery contained certain clauses, terms and conditions which were in violation of the Clayton Act of Oct. 15 ,1914. The court affirmed the decree of the District Court of the U. S. for the Eastern District of Missouri, that these leases were violative of the law in that they tended to monopoly.

The Supreme Court in its opinion held that Section 3 of the Clayton Act makes it unlawful for persons engaged in interstate commerce "to lease machinery, supplies or other commodities, whether patented or unpatented, for use, consumption or resale in the U. S., or to fix a price therefor, or to discount from, or rebate upon such price upon the condition agreement or understanding that the lessee shall not use or deal in the machinery, supplies or other commodities of the competitor or competitors of the lessor, where the effect of such lease, agreement or understanding may be to substantially lessen competition or tend to create a monopoly."

The effect of the decision is to enjoin the United Shoe Machinery Co. of Maine, the United Shoe Machinery Corporation and the United Shoe Machinery Co. of New Jersey, from making leases containing certain clauses, terms and conditions requiring the sole use of these machines.

Navy Sending Text Books to Engineering Schools

The bureau of engineering, of the Navy Department, is furnishing the engineering schools of many of the colleges of the country with copies of its general specifications for machinery. These specifications represent modern practice in naval engineering, and with their several appendices describing methods of inspection, etc., are practically textbooks on this highly specialized subject. There are very few colleges that have regular courses in marine engineering, and during the World War special schools were established for the instruction of the personnel required to man the vessels operated by the Navy. As the conditions obtaining on a naval vessel are very different from those found in power plants ashore, the specifications are of considerable value for instruction purposes.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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The breezes are freshening. The sea is somewhat rougher and the ship of business is commencing to toss a little, although she is moving with greater speed. The barometer is rising, but a gale is possible even with a rising barometer, and the careful navigator will now be ready to shorten sail if it blows too hard.

On the New York Stock Exchange trading has become very active. Two million shares changed hands last Monday, but on Tuesday, when the market seemed strongest, its strength suddenly turned to weakness concurrently with the announcement that the Republican caucus in the Senate had voted to pass some sort of a bonus bill this session.

There may have been no relation of cause and effect between the action of the caucus and the decline in the stock market, but the coincidence shows the need of caution in an excited market, and though much of the decline has been recovered there are a few gathering clouds that should be watched.

One of them is the coal strike. As it continues without any real effort at settlement or conciliation the feeling is becoming more bitter and it may flare up in some attempt at violence that will shock the nation.

Another is the New England textile strike. It is becoming an obstinate and sullen fight that must be causing much loss to capital and great distress to labor.

An Evil Combination

Still another is the treaty between Germany and Soviet Russia which has nearly disrupted the Genoa Conference and has shocked Europe. Taken in conjunction with the report that Germany has agreed to lend Russia the equivalent of 23,800,000 gold dollars to be spent for German goods the treaty is construed as notice of an economic alliance between the two political Ishmaelites of the world whose power for evil in combination is supposed to be great and might have to be restrained by another war which, as Lloyd George says, would leave Europe a heap of ashes.

And finally there is the bonus bill already referred to. In whatever form it becomes law and however it may be sugar-coated it means an increase of taxes or more government loans. As these are the two things that business men are most afraid of it is not surprising that the money market is a little firmer and Liberty Bonds a little weaker. The feeling of apprehension thus reflected has been somewhat intensified by Secretary Mellon's figures indicating a Treasury deficit of $484,000,000 for the fiscal year ending June 30, 1923, but it would be unfair to charge the steadier money market and the decline in Liberty Bonds entirely to the bonus bill. Stock brokers are increasing their loans and their operations are commencing to make some impression upon the loanable surplus of the banks.

As might have been expected under these circumstances the reserve ratio of the Federal Reserve System has declined slightly despite an increase of $5,000,000 in the gold held. It now stands at 77.3 as against 77.7 per cent a week ago. The result is a slight hardening in the rate for commercial paper, which sold as low as 4¼ per cent early in the week when the oversubscription on the 3½ per cent Treasury certificates was announced.

Money Still Easy

These developments lead me again to advise prospective borrowers to take advantage of the present ease in money to cover their requirements as far ahead as possible. According to the Federal Reserve Bulletin for April $913,303,000 foreign dollar loans were issued in the United States between Jan. 1, 1921 and March 15, 1922. Of this total $263,000,000 was issued this year, and since March 15 a good many more large loans have been floated. The total of the domestic loans concurrently placed. including state and municipal bonds, must be much greater. Some authorities estimate that the aggregate of new and refunding bonds sold in the last fifteen months is over four billions.

A large portion of the money thus raised is still in the banks, but it was borrowed to be spent and when it is in circulation rates will probably be higher. For this reason it is likely that Liberty Bonds are about as high as they will go at present. They sell in direct relation to the money market and when they are at or near par the present Secretary of the Treasury, who is very canny, may postpone further buying for the sinking fund.

There is, in fact, some indication that the whole bond market, including taxables as well as non-taxables and government issues, is in a condition of satiety. It has been the fashion of late to describe it as insatiable, though everyone knows that such a condition can never last very long and that repletion and flatulence often follow overeating. As to stocks it is anyone's guess. Many of the industrials seem high enough but the railroad shares that represent the equity in and control of our transportation system have a strategic as well as an intrinsic value in combination that are not yet fully realized and will not be appreciated until the inevitable consolidations for which the Esch-Cummins bill provides are seriously undertaken. This is, however, a long distance view and the stock market, including railroad shares, will continue to be "fluctious" in the interval and afterward.

Geographically viewed the Pacific Coast States are still the most cheerful part of the country, and Southern California is especially elated by the prediction that a new vessel shortly to be put in service between New York and Los Angeles will make the voyage in eleven days. The railroads are taking notice and are advertising a drastic reduction in transcontinental passenger rates for the summer. The outlook in Canada is also improving and much speculative excitement is reported over the alleged discovery of oil in Alberta.

Of the commodity markets and distributive trade in general there is not much new to say. Wheat futures suddenly jumped up several cents a bushel when the trade became conscious that most of the existing supply had been hedged and that the hedges would have to be bought in as the grain is sold. Cotton has also been firm as the strength of the statistical position became apparent. Coffee has been almost buoyant as the trade and the public have come to an appreciation of the conditions to which attention was drawn in these letters some months ago.

The steel industry is almost booming. Copper is in better demand. Tin is higher and rubber is up about 2½ cents a pound since attention was first called to its cheapness in this letter. The advance is traceable to the increased demand for tires, which in turn reflects an improvement in the automobile business. Silk is firm and higher. Wool is quiet but firm.

Optimism on Wall Street

In so far as it is communicable it would appear that the optimism which prevails on the Stock Exchange is gradually infecting and affecting business generally. Upon this theory it is to be expected that wholesale and retail merchants will find themselves getting busier as the boom in stocks nears its perihelion. A continuous and general increase in building activity is again reported in nearly every section of the country.

Progress in the reorganization of Mexico's finances is indicated by the reports from the bankers' conference now being held in Paris, and the Greek banks which were closed by the monetary panic in that country have reopened.

Despite the news from Genoa the London Stock Exchange has been "firm on easy money" and foreign exchange is generally higher. Even German marks are slightly higher though the total outstanding is now 131,837,249,000, which is an increase of over a billion for the week ending April 7. As suggesting what may happen unless the German presses printing marks are stopped, attention is called to the situation in Russia, where it takes 75,000 rubles to pay a street car fare and the amount of paper money in circulation runs into the quadrillions.

Industrial Developments in France

BY C. E. CARPENTER
President, C. E. Carpenter Co., Société Anonyme, Paris

Business in France in the metal-working industries continues to show an improvement over 1921, although cases of marked progress are not plentiful. The improvement is confined principally to what is known as the *petite mécanique*, as distinguished from the *grosse métallurgie*, among which are classed the blast furnaces, steel mills and the makers of heavy manufactured material. In the *grosse métallurgie* the stagnation is reported to be acute, with few or no signs of a possible early amelioration.

Just how much this is due to the reduction in naval armaments it is difficult to state, but one prominent manufacturer recently expressed the opinion that the new policy of reduction in naval armaments will have serious consequences for the metal-working plants in France, which, in the past, have depended to a great extent upon navy orders to keep their plants in operation. As he expressed it, France has always had in course of construction a certain amount of tonnage in battleships, cruisers, destroyers and submarines, not only for her own needs but for those of other countries as well, thus providing a large amount of work for the rolling mills, the engine builders and boilermakers, the electrical shops, bolt makers and a score of other industries. As these orders are to be greatly restricted in future, it will be very difficult for the plants that formerly looked to them as their main source of business to find work for the capacity thus released, particularly in the face of the impoverished condition of the world and the active competition of Germany, Belgium, Great Britain and the United States for such foreign business as is offered. The railways cannot well be looked to for the tonnage needed to take the place of the reduced navy purchases, although the electrification plans now well under way will help considerably by distributing orders throughout the country for a large number of electric locomotives, turbines and other equipment.

Big Export Combination Formed

Under the circumstances, therefore, it seems that if France is to keep her mills and great metal-working establishments properly employed, it will be necessary for her manufacturers to take energetic steps to secure a much larger amount of foreign business than they have sought heretofore. That some of the manufacturers realize this is evidenced by the recent formation by the Aciéries de Longwy, together with a group of other mill owners and manufacturers, of an exporting company known as Longovica, Compagnie Industrielle et Commerciale d'Exportation, with a capital of twenty million francs. The headquarters of the new company are in Paris and the subscribers to it are: Electro-Métallurgie de Dives, Ateliers de Construction du Nord de la France (Blanc Misseron), Société Louvroil et Recquignies, Ateliers de Forge et d'Estampage de Vieux-Condé, Société Métallurgique de Gorgy, Aciéries Gouvy de Dieulouard, Renault (the well-known automobile builder) Société Rateau (turbines and pumps), Forges et Ateliers de Commentry-Oissel and Société des Constructions et Grandes Entreprises de France. All of these concerns are leaders in their particular fields and the association of so powerful a group, backed by ample capital and credit facilities, should make it possible for a great French selling organization to be built up throughout the world.

In the *petite mécanique*, in some industries a very considerable improvement is noticeable. In St. Etienne, for example, the manufacture of bicycles is running to capacity, fully employing not only the recognized bicycle plants but practically all the parts makers as well. In all the establishments overtime is the rule, and it is estimated that this year's output of bicycles will exceed the best year yet known. Bicycles are being shipped in large numbers to foreign countries, even Belgium being a heavy buyer of French makes. It is reported also that there is a growing demand for Browning pistols and that the makers of these arms are speeding up their capacity. This, coupled with the manufacture of shot guns and hunting rifles, is an important industry in St. Etienne and a revival in the demand means a substantial reduction in unemployment in that section.

Still Making Firearms

In Paris, it is reported that another branch of the firearms industry has succeeded in closing a substantial foreign contract, the Hotchkiss Company being credited with having received an order from a South American country for machine guns to the value of sixty-five million francs. If the report proves to be correct, and there seems to be no reason to doubt it, the order will provide several years of work. Following the armistice, the Hotchkiss Company, which during the war operated a large plant at Lyons from which it furnished many thousands of machine guns to the A. E. F., acquired the fine new plant in the outskirts of Paris built by Clerget-Blin for the manufacture of aviation motors. The plant has been rapidly converted for the manufacture of machine guns. The running of this plant at full capacity should provide employment for several hundred men now out of work. The operating head of the Hotchkiss Co. is a well-known American engineer, Laurence V. Benét, who is one of the most prominent members of the American colony in France and a founder of the American Chamber of Commerce.

Automobile Business Improves

Another industry that indicates a satisfactory state of improvement is the manufacture of light-weight, low-consumption automobiles. The plant of André Citroen, which will be remembered during the war as a model of efficiency in shell making, is reported to be operating at maximum capacity on the 10 hp. model car, sixty cars per day being regularly turned out, with all cars sold in advance. A smaller car is being brought out by the same firm and will shortly be manufactured in the Clément-Bayard plant at Levallois-Perret, a few miles from Paris, this plant having recently been acquired for this purpose. The new car is a 5 hp. model and it is stated that the Citroen interests have already in hand orders amounting to approximately two hundred million francs for this model alone. Other car builders have likewise lately placed on the market new models of light weight cars and judging from the increasing numbers of these cars seen on the streets and highways the public has opened its purse to the newcomers in a generous fashion. A low-powered small car can now be purchased for 8,500 to 9,500 francs, which brings it within the means of a large section of the population that has since 1914 been deprived of the luxury of an automobile. What is even more important, however, is the fact that the cost of operation of the small car is more within the means of the masses than the cars heretofore built in France. The new models are designed to give approximately 45 miles to the gallon of gasoline on the road and a correspondingly low oil consumption and tire expense. The high cost of these items in France during the past two years has done more than anything else to discourage the public from buying automobiles and to cripple the great French automobile industry.

The reports that are received from the northern part of France indicate that rapid progress in the reconstruction of the manufacturing plants destroyed by the Germans is being made. The great works at Blanc-Misseron, for example, have been almost completely rebuilt and it is expected that before the end of this month the first locomotive built by them since the war will leave the shops. Satisfactory progress is also being made on the construction of the 200,000 hp. electric power station at Comines, which with the exception of the station at Gennevilliers, near Paris, will be the most powerful station in France. It will utilize the coal near the mines and will be of great help to the north in getting under way again.

"Zamium" Plant at Boonton

A suitable plant for the manufacture of Zamium, the metallic alloy invented by Lawrence Zamboni, will be erected at Boonton, N. J. The Zamium Corporation has been organized and incorporated, and production will start as soon as the factory is completed.

This alloy is said to be a reliable and a less expensive substitute for platinum. It is claimed for the alloy that it cannot rust, tarnish or corrode; is non-magnetic; can be cast, rolled or drawn, soldered or welded; is not affected by any kind of acid, alkali or sea water and has a tensile strength of 150,000 lb. per square inch.

The company will market the product in all forms for the manufacture of jewelry, cutlery, surgical instruments, marine hardware and engine and motor parts.

Officers of the corporation are: Lawrence Zamboni, president and treasurer; Ferdinand Rollini, vice-president; A. L. Zamboni, secretary.

The corporation retains a business office at 149 Broadway, New York City.

American Gear Manufacturers' Association in Buffalo—Interesting Reports—Sinram Re-elected President

The spring meeting of the American Gear Manufacturers' Association was held at the Hotel Lafayette, Buffalo, N. Y., on April 20, 21 and 22. The convention was opened by an address entitled "Over the Threshold of a New Era," by President F. W. Sinram. Following this, the usual reports were made by the respective officers and committee chairman.

F. D. Hamlin read the reports of the secretary and treasurer; F. F. Goedke on entertainment; George L. Markland, Jr., on membership; H. E. Eberhardt, on public policy; J. E. Gleason, for the legal committee; J. C. McQuiston, for the publicity committee; L. L. Nicholson, for tariff; and J. B. Foote, on industrial relations. After the reports had been received and acted upon, H. E. Harris read a paper on "Good Hob Practice." He advocated the use of hooked tooth hobs and demonstrated the action of various shapes of cutting edges.

The use of the projection comparator in testing gear teeth was shown by Ralph E. Flanders, a machine being set up in the meeting room and demonstrations made with both gears and gear cutters. This produced a magnification of about 100, and showed very interesting results. Discussion followed on the methods and equipment used.

The reports of the A. G. M. A. sectional committee of the Engineering Standards Committee was presented by the chairman, B. F. Waterman, who is also chairman of the general standardization committee of the association. Both of these reports showed progress along desirable lines. Mr. Waterman pointed out that it might, and probably would, be desirable to reconsider some of the proposed standards in view of suggestions brought out at the committee meetings. He showed the inadvisability of adhering to a proposed standard unless it was of such a nature as to make its adoption by other engineering bodies practical. In conclusion he suggested that whatever standard was finally adopted it should be a real American standard, rather than having various separate bodies establish standards of their own. Other reports were made by the spur gear committee, bevel and spiral bevel committee, herringbone committee, and the committee on gears and pinions for electric railways and mines.

Further proceedings included the reports by chairmen of committees on uniform cost accounting systems, J. H. Dunn; nominating committee, A. C. Gleason; nomenclature, F. E. Eberhardt; worn gears, J. C. O'Brien; inspection, J. C. Eppley; and composition gearing, John Christensen.

At a meeting of the industrial group, George L. Markland, Jr. presided. The topic was "Conditions in the Industry" and the discussion brought out some very favorable comment on present industrial relations. An informal banquet was held on the evening of the twenty-first at which President Sinram was toastmaster, and John C. Bradley, of the Pratt & Letchworth Co., the principal speaker. His topic was "What's Ahead" and was very interesting. After the dinner J. C. McQuiston exhibited a radio telephone and explained its construction and operation.

The program for the last day was of peculiar interest to gear manufacturers. The papers included "Proportions of Industrial Gears," by G. E. Katzenmeyer, of the R. D. Nuttall Co.; "Keyways," by Lars Nilson; "Sprockets," C. R. Weiss; "Metallography," C. B. Hamilton, Jr.; "Transmission," by A. C. Bryan; "Differentials," S. O. White; "Tooth Forms," H. J. Eberhardt. E. W. Baxter rendered a report for the library committee. Another session considered the industrial conditions from the automotive point of view.

In the afternoon the grinding of gear teeth and its future in the industry was discussed by R. S. Drummond of the Gear Grinding Machine Co. The Gleason Works system of bevel gears, which was shown at the meeting in Rochester last October, was further explained in detail by F. C. McMullen and T. M. Durkan. Abstracts of some of these papers will appear in later issues.

DOMESTIC EXPORTS OF METAL-WORKING LATHES, BORING AND DRILLING MACHINES FROM THE UNITED STATES, BY COUNTRIES, DURING FEBRUARY

Countries	Lathes No.	Lathes Dollars	Boring and Drilling Machines No.	Boring and Drilling Machines Dollars	Planes and Shapers, Slotters No.	Planes and Shapers, Slotters Dollars	Milling Machines No.	Milling Machines Dollars
Belgium	..	..	..	..	1	4,078	1	381
France	..	..	1	347	1	750	..	..
Greece	1	150	..	..	..	..	..	..
Netherlands	..	..	24	120	..	..	..	..
Sweden	1	675	..	..	..	..	..	..
Switzerland	..	..	12	60	..	..	..	..
England	..	..	28	640	..	..	6	10,178
Scotland	..	..	1	1,200	..	..	..	..
Canada–Maritime Provinces	2	409	..	..	..	..	..	..
Quebec and Ontario	22	9,210	21	2,786	4	3,519	8	2,375
Prairie Province	2	13	..	..	..	..	..	..
Canada–Br. Columbia and Yukon	1	1,850	..	..	..	..	1	200
Salvador	..	..	1	40	..	..	..	..
Mexico	4	602	3	6,622	..	..	6	30
Cuba	1	1,740	..	..	..	..	..	..
Dominican Republic	1	3,907	..	..	..	..	..	..
Argentine	..	..	21	546	..	..	..	..
Brazil	1	9,120	..	..	..	..	..	..
Chile	3	2,021	..	..	..	..	..	..
Colombia	..	..	1	4,461	..	..	..	..
Peru	..	..	2	535	..	..	..	..
British India	..	..	..	..	..	..	1	3,049
China	1	17	..	..	..	..	..	..
Hongkong	1	651	2	315	2	1,022	1	1,376
Japan	3	5,156	9	18,167	2	2,704	3	6,202
New Zealand	..	..	1	373	..	..	..	..
Total	44	35,521	127	36,212	10	12,073	27	23,791

Obituary

LEROY S. STARRETT, founder and president of the L. S. Starrett Tool Co., of Athol, Mass., died on April 23 at his winter home in St. Petersburg, Fla. He was 84 years old. Mr. Starrett was the inventor of many types of measuring tools and gages, and was known for his benefactions in the interests of his employees, with whom he maintained a close relationship.

WILLIAM A. GREAVES, SR., a founder of the firm of Greaves & Klusman, machine tool manufacturers of Cincinnati, Ohio, died at his home in Hyde Park on April 19. He was 60 years old. A few years ago Mr. Greaves, with his two sons, organized the Greaves Machine Tool Co., in Cincinnati, and he was its president at the time of his death.

CHARLES THOMPSON, drop forge manufacturer, died at his home in Fremont, Ohio, recently.

ELLIS M. BURR, president of the Burr Company, of Champaign, Ill., died in that city on April 3.

CURTIS B. HATHAWAY, one of the organizers of the General Motors and Chevrolet Corporations, died at Pinehurst, N. C., on April 5. He was 63 years old.

Peter Lowe, of Kempsmith Company, Dead

Peter Lowe, assistant secretary of the Kempsmith Manufacturing Co., Milwaukee, Wis., died April 13 at his home in Garrett, Ind. He had retired from active association with the company's sales department some time ago, due to failing health. He was 45 years old.

Mr. Lowe started his career in the machinery field as a machinist with the Gisholt and with the Nordyke & Marmon companies. In 1906 he entered the

PETER LOWE

employ of the Kempsmith company as head of the cost department. He was transferred to the sales department in 1911 and a few years later was appointed assistant secretary.

As a machine tool salesman Mr. Lowe enjoyed a wide acquaintanceship among machinery builders, who were deeply grieved on hearing of his death.

The Trend of Business Improvement—Plants Resuming

The American Locomotive Co. is arranging for immediate increase in operations at its Richmond, Va., plant, which has been running on a curtailed schedule for about a year past. The working force will be brought up to close to 1,000 men at an early date. The company has received an order from the Southern Railway for thirty locomotives of Mikado type, with cost to approximate $1,100,000.

The Columbia Motor Co., Detroit, Mich., has adopted a capacity operating schedule at its plant, and will increase production each month for the next quarter-year. During April the works will produce 600 cars; in May, 1,200 cars; and in June, 1,500 cars. It is expected to maintain the latter basis of operation thereafter.

The Fisher Body Co. is operating at full capacity at its plants at Detroit, Mich., with regular working quota, and has adopted a similar basis of operation at its Ohio works. At Cleveland the company has acquired a small body plant and will place it in service on a capacity basis at once.

The American Car and Foundry Co. is arranging for immediate increase in the working force at its plant at Buffalo, N. Y., and proposes to more than double the present number of men within sixty days. Orders for freight and other cars received by the company during the past few months totals 7,000 cars, of which 2,000 will be constructed at the Buffalo works. An order has just been booked for 1,000 freight and refrigerator cars for the Northern Pacific Railroad, to cost about $2,300,000.

The Atchison, Topeka & Santa Fe Railway Co. is increasing the working force at its shops at Temple, Tex., and will soon be operating at close to normal.

Following an increase in production at the plant of the Saxon Motor Car Co., Detroit, Mich., arrangements are being perfected for the operation of a new works at Ypsilanti, Mich., where the plant of the Apex Motor Co. has been leased for a period of three years. The initial production will be on a basis of fifteen automobiles per day, giving employment to approximately 200 men.

The Colorado & Southern Railroad, Denver, Colo., is planning for the purchase of 200 new refrigerator cars and 1,000 steel gondola coal cars, to cost $1,425,000. The company is increasing operations at its shops for locomotive and car repair work. A large portion of the new shops to be constructed at Denver, by the Chicago, Burlington & Quincy Railroad, Chicago, Ill., the parent organization, will be used for Colorado & Southern work. The plant will consist of a number of one-story buildings, comprising machine shops, locomotive repair shops, wheel works, car and bolster works, estimated to cost close to $1,500,000, including equipment. Erection will be commenced at an early date.

The American Bearing Corporation, Indianapolis, Ind., is arranging for immediate increase in manufacture of automobile bearings, and will occupy a one-story plant on Tenth St., recently acquired. The works will be equipped at once, and the present factory at 212 West McCarty St., discontinued. The company comprises a reorganization of the American Bearing and Die Casting Corporation; Arthur Dixon is president.

The American Cast Iron Pipe Co., Birmingham, Ala., has developed production to a point of close to normal, with full working force. The National Cast Iron Pipe Co., in this same district, has also increased operations to capacity.

The Glasgow Iron Co., Pottstown, Pa., has resumed production at its local mill, following a shut down for many months past. The local puddling furnaces of the company have also been started up.

The Texas & Pacific Railroad Co. will increase operations to capacity at its shops at Marshall, Tex., for the rebuilding of a large number of freight cars.

The Stewart-Warner Speedometer Corporation, Chicago, Ill., has increased production at its plant from 4,200 speedometers to 5,700 units per day, or more than six times the low record output in 1921. In the tank department, operations have been advanced from 4,000 to 4,800 units daily.

The Lima Locomotive Co., Lima, Ohio, has received orders for forty locomotives from the New York Central Railroad, and for thirty locomotives from the Mobile & Ohio Railroad. The company has contracts on hand to insure capacity production for a number of months to come.

The Reynolds Spring Co., Jackson, Mich., is planning for extensive increase in production, and during the next sixty days will add about 500 men to the working force, increasing plant facilities to provide for the expansion. The company has received an order from the DeForest Radio Telephone & Telegraph Co., New York, for radio equipment to an amount of about $5,000,000. Expenditures for raw and finished materials for manufacture will approximate about $190,000, during the coming month.

The Durant Motor Co. of Michigan, Lansing, is arranging for an immediate increase of about 60 per cent in its working force, for the production of the Durant and Star automobiles. Work will be commenced at once on the erection of two additions to the plant, to provide for double the present capacity. Upon completion, production will be on a basis of 600 cars a day of both types.

The J. G. Brill Co., Philadelphia, Pa., has received a contract from the Boston Elevated Railway Co., Boston, Mass., for 100 steel passenger cars. The company has also take an order for fifteen traction cars for the South Bend, Ind., Railway.

The McClintic-Marshall Co. is increasing production at its structural steel works at Pottstown, Pa., and a number of additional employees will be added to the working force. The Shoemaker-Satterthwait Co., operating a similar local plant, is also increasing its production schedule.

The Pennsylvania Railroad Co. has increased the working force at its Altoona, Pa., car shops to a point of close to normal, and a double-shift operating schedule has been adopted in the steel car shops.

The Spicer Manufacturing Co., South Plainfield, N. J., manufacturer of automobile axles, universal joints, etc., has increased its working force to about 1,000 men at its local plant. The company has reopened its branch plant at Pottstown, Pa., which has been closed for about six months past.

The Jordan Motor Car Co., Cleveland, Ohio, now operating on a basis of forty cars per day, is arranging for a production increase early in May, to continue for an indefinite period.

Following the purchase of the plant of the A. W. Case & Son Manufacturing Co., Kensington Ave., Buffalo, N. Y., by the Richardson & Boynton Co., Dover, N. J., manufacturer of stoves, ranges, etc., the new owner has plans under way for a large increase in production. New buildings will be erected and equipped for the manufacture of stoves flanges, fittings, etc. Present operations, in the meantime, will be on a capacity basis. The Case company, manufacturer of a kindred line of stove parts, will remove the Kensington Ave. works to its other plant in the city.

The Middletown Car Co., Middletown, Pa., a branch of the Standard Steel Car Co., Pittsburgh, Pa., is increasing operations at its plant, and will soon develop capacity on an order for the Philadelphia & Reading Railroad Co., for 500 steel hopper cars.

The Deister Machine Co., Fort Wayne, Ind., reports that it has received more orders during the past few weeks, than in the entire year of 1921. The company manufactures mining machinery.

Car Surplus, Shortage and Freight Loadings

Reports of the car service division of the American Railway Association show that revenue freight loaded for the week ending April 1, 1922, totaled 827,011 cars a decrease of 19,024 cars from the preceding week, but 163,840 cars more than were loaded in the corresponding week of 1921. Compared with 1920, the report shows 31,816 cars less.

Grain, grain products, live stock and forest products all show some reduction in loadings compared with the previous week. Coal loading, which includes that loaded on the first day of the miners' strike, shows a decline of 19,634 cars, but is far in excess of the figures for the same period in the two previous years. Coke and ore show small increases; merchandise shows a gain of 1,911 cars, and miscellaneous 667 cars, the smallest gains made in these two classifications for some weeks past. All districts contributed to the decrease in loading compared with the week ending March 25 with the exception of the Pocahontas and the Northwestern districts. The slight gain in the Pocahontas district is largely in miscellaneous, while in the Northwestern district coal, forest products and miscellaneous show moderate increases.

Serviceable surplus cars totaled 206,746 for the week ending April 1, or 12,737 cars less than for the week ending March 23. Of these, 88,491 were box cars, 72,566 gondolas and the balance miscellaneous. Compared with the previous week box cars increased 1,038, while gondolas decreased 13,198.

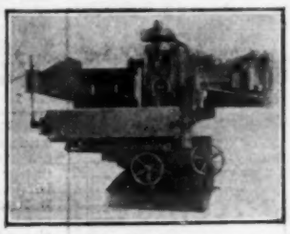
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Die-Sinking Machine

Pratt & Whitney Co., Hartford, Conn.

"American Machinist," Jan. 5, 1922

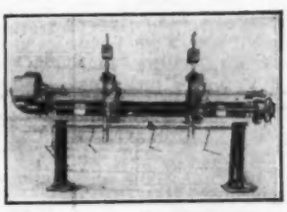


By the "Bayrer's compensating arms," a die weighing 4 tons may be suspended on elevating screws, swiveled, tilted or turned on edge. There is a rapid traverse for the quick adjustment of the head. Speed and feed changes are made by levers in front. Hand and power feeds are provided for both the longitudinal and crossfeeds of the table and a rapid power traverse for all table movements. A cherrying attachment may be applied to the cutter head, driven through gearing to the nose of the cutter spindle. Table, 22 x 48 in. Longitudinal feed, 48 in. Crossfeed, 17 in. Vertical feed, 15 in. Vertical feed of cutter head, 12 in. Spindle speeds, twelve from 27 to 790 r.p.m. Floor space, 10 x 10 ft. Height, 9 ft. Weight, 15,000 lb.

Drilling Machine, Multiple, Rail-Type, No. 19

Edwin Harrington, Son & Co., Philadelphia, Pa.

"American Machinist," Jan. 5, 1922



The chief feature of the machine is the in-and-out movement provided for each spindle for drilling irregular patterns. Four spindles are ordinarily furnished. The driving pulleys transmit 25 hp. By a clutch on the driving gear, any spindle may be stopped independently of the others. The feed may be operated universally for all spindles from the right-hand end of the machine, or separately for each spindle at the end of each arm. A handwheel on each head moves the spindles independently and sets them at the proper height when universal feed is used. Automatic stops disengage each spindle at any predetermined point. Floor space without a table, 17 ft. 10 in. x 7 ft. Height, 10 ft. 2 in. Weight with belt drive, 14,850 lb.

Drilling Machine, Vertical, 32-In.

Prentice Conradson, Green Bay, Wis.

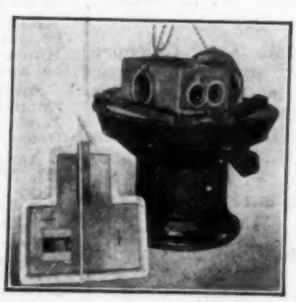
"American Machinist," Jan. 5, 1922

The machine has a swing of 32 in., but can be built in 25- and 36-in. sizes. The headstock, column and base are cast in one piece. Rectangular and sliding tables can be supplied. The driving motor is so mounted as to eliminate all moving parts possible. There are nine spindle speeds ranging from 34 to 500 r.p.m. Six feeds are provided ranging from 0.006 to 0.035 in per spindle revolution. Hand traverse, hand feed, stop and depth gage are provided. A no-load protection is also included. A 3-hp. motor running at 1,200 r.p.m. is used, but for extra heavy work a 5-hp. motor running at 1,800 r.p.m. can be employed. Floor space, 30 x 54 in. Height, 11 ft. 8 in. Weight, 3,700 lb. Export box, 135 cu.ft.

Grinding Machine, Disk, Vertical Spindle

Badger Tool Co., Beloit, Wis.

"American Machinist," Jan. 5, 1922

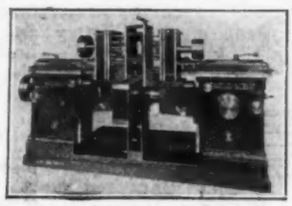


The steel disk wheel is 42 in. in diameter and is faced with a layer of abrasive material ½ in. thick molded on it. Direct drive is secured by using the motor shaft as the wheel spindle. The end yokes are dust proof and rigid. Positive forced-feed lubrication is supplied to both the radial and thrust ball bearings. A circular dust channel surrounds the wheel periphery and terminates in two openings to which the dust exhaust system is attached. The open construction makes it possible for more than one operator to work at the machine at a time. A 20-hp. motor running at 600 r.p.m. is used. Stop bars prevent the work from rotating with the wheel. Weight, 3,800 lb.

Drilling Machine, Automatic

Sellew Machine Tool Co., Pawtucket, R. I.

"American Machinist," Jan. 5, 1922

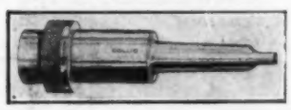


The machine is for production work on parts requiring multiple drilling on opposite sides. Work is changed in one arm of the work holder at the front of the machine while the work between the heads is being drilled. Both heads move forward simultaneously. The drills run at speeds proportionate to their diameters, each kind of work requiring different heads. The drill is slowed at its entrance into the work and when it breaks through. The heads have a quick return. Length 10 ft.; weight 5,000 lb.

Chuck, Quick-Change, "Wonder"

Collis Co., Clinton, Iowa

"American Machinist," Jan. 5, 1922

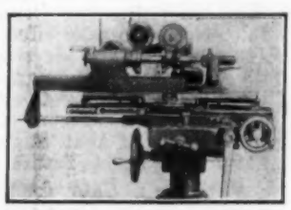


The chuck is adapted to use on drilling machines, lathes, screw machines, and other machines with revolving spindles, and allows rapid change of tools without stopping the spindle rotation. The collets have taper shanks and can be inserted without touching the chuck. Collets for holding different tools, such as taper-shank and straight-shank drills and hand taps, can be furnished. A special collet is provided for drills with twisted tangs or broken shanks. The chucks are made in six sizes, with standard taper shanks from Nos. 1 to 6, and outside diameters from 1⅛ to 5½ in. Collets are also made in a range of sizes to fit the chucks, and to hold drills and tools of different sizes.

Grinding Attachment, P. & W. Curvex Cutter

R. K. Le Blond Machine Tool Co., Cincinnati, Ohio

"American Machinist," Jan. 5, 1922

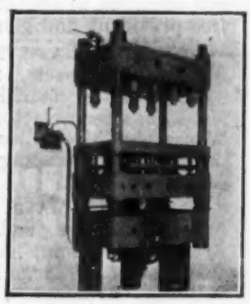


The maximum travel of the atachment is 8¾ in. The cutters can be ground in diameters up to 5½ in. and lengths up to 7½ in. Since the flutes of the Curvex cutters are helical, the attachment is arranged to grind leads of from 9⅛ to 172 in. per revolution. As the table of the grinder is fed horizontally, the cutter spindle is automatically revolved in proper relation to the lead and helical angle. The cutter is indexed by the plunger and index plate at the left of the arbor. The work is fed vertically to the wheel to the entire depth of the tooth. The grinding plane is always on a true radial line of the cutter, and the wheel clears itself in the work Weight: for hobs only, 90 lb.; complete attachment, 110 lb.

Press, Hydraulic, Automobile Body

Southwark Foundry and Machine Co., Philadelphia, Pa.

"American Machinist," Jan. 5, 1922



The press has a capacity of 450 tons. One clamping platen and one stripper platen are provided. The stripper platen carries four hydraulic cylinders acting upon a forged steel plate, which in turn carries sixty stripper pins 1⅛ in. in diameter. The adjustable top platen carries eight hydraulic jacks used for clamping, each having a 5-in. ram and 5-in. stroke. The press is controlled by a single lever-operated valve. The automatically controlled clamping cylinders are capable of standing an hydraulic pressure of 5,000 lb. per square inch. Die space, 7 x 5 ft. Vertical opening between the platens: minimum, 18 in.; maximum, 4 ft.

Clip, paste on 3 x 5-in. cards and file as desired

Personals

WILLIAM B. GIVEN, JR., vice-president of the American Brake Shoe and Foundry Co., has accepted the chairmanship of a committee co-operating with the Salvation Army in its appeal for $500,000 to carry on welfare work in the machinery industry in Greater New York.

C. J. HOUCK has been appointed foundry superintendent of the Hess-Snyder Co., Massillon, Ohio. He was formerly connected with the malleable plant of the Timken Detroit Axle Co., Canton, and previous to that time was with the Vulcan Iron Works, at Denver, Col.

H. E. HARVEY, for the past five years assistant works manager for the Remington Arms Co., Bridgeport, Conn., has become superintendent of the Elyria Iron and Steel Co., Elyria, Ohio.

WILLIAM OCHASE, formerly sales representative of Manning, Maxwell & Moore, Inc., at Chicago, has been made efficiency engineer of the Ohio Machine Tool Co., at Kenton, Ohio.

J. R. DANGLER, formerly assistant to the president of the Central Steel Co., Massillon, Ohio, has been appointed secretary and treasurer of the Vacuumeter Manufacturing Corporation, Cleveland, Ohio.

FRED HEISER has been appointed foundry superintendent of the malleable department of the Superior Steel Castings Co., Benton Harbor, Mich. He was formerly in charge of the malleable foundry of the Timken Detroit Axle Co., Canton, Ohio.

LOUIE S. JONES, one of the best known men in the machinery field, has resigned as general sales manager of the Lumen Bearing Company, of Buffalo, N. Y., to take effect July 1. Mr. Jones will retain his stock interest in the Buffalo and Youngstown plants of the Lumen Bearing Company and will also remain a director of the Youngstown plant of that company. He has not decided on his future plans.

WILLIAM L. COLT, for five years manager of Willys-Overland, Inc., in the Eastern district, with headquarters at New York, has resigned to become the president and active head of the Overland-Providence Co., Willys-Overland distributors for Rhode Island, which concern he established and financed about a year ago. Carl P. Spiegelberg, who organized the Overland-Providence Co., under the supervision of Mr. Colt, will continue to operate the business as vice-president and general manager.

GEORGE M. BASSETT, of the firm of Johnson & Bassett, manufacturers of wool spinning machinery, Worcester, Mass., has been elected president of the Worcester Mechanics Savings Bank, that city, succeeding John H. Coes, deceased.

EDMUND C. MAYO, president of the American Tube and Stamping Co., Bridgeport, Conn., has been appointed a trustee of the large Municipal Garage building, Bridgeport, by Mayor Fred Atwater.

WILLIAM R. WEBSTER, vice-president of the Bridgeport Brass Co., Bridgeport, Conn., was elected a director of the American Tube and Stamping Co. at the recent annual meeting of the company.

JAMES C. POTTER, president of the Potter & Johnson Machine Co., machine tool manufacturers, Pawtucket, R. I., was chosen a director of the Slater Trust Co. at the recent annual meeting of that organization.

FREDERICK J. KINGSBURY, president of the Automatic Machine Co., Bridgeport, Conn., has been elected a director of the American Tube and Stamping Co.

Business Items

The Ready Tool Co., of Bridgeport, Conn., has discontinued its representation through the Mayhew Steel Products Co., and in the future will handle its sales through the Bridgeport office.

The Meldrum-Gabrielson Corporation has opened its new factory at West Fayette and Niagara Sts., Syracuse, N. Y. This addition will be used for the manufacture of milling machine, gages, wood and metal patterns and small tools.

The J. M. Purves Tool Co. has been incorporated at Syracuse, N. Y., to manufacture and sell machine tools and appliances. The concern is capitalized at $150,000. Directors are J. M. Purves, W. A. Meyers, F. E. Friedman and J. A. Purves.

The James N. Kemp Machine Works, of Albany, N. Y., has been incorporated with a capital stock of $250,000. Directors are J. N. Kemp, M. L. Kemp, and W. C. Marron, all of Albany.

The Simmons Machine Co., Albany, N. Y., has opened a machinery warehouse at 182 Lafayette St., New York City. Machine tools which have been rebuilt at the Albany plant will be stored in this warehouse.

The Detroit office of the Taft-Pierce Manufacturing Co. has been moved from the Majestic Bldg., to 2230 First National Bank Bldg.

The Max Ams Machine Co. has opened new offices at 705 Commerce Bldg., Rochester, N. Y. H. S. Freeman is in charge.

At a meeting of directors of the Burr Company, machinery builders, of Champaign, Ill., the following officers were elected: Alvin Huckins, president; Marford Savage, vice-president; N. G. Burr, treasurer; W. S. Redhed, secretary.

The National Scale Co., Chicopee, Mass., recently filed papers of incorporation under the laws of Massachusetts to manufacture scales. The capital stock is $70,000, and the officers are: Frank D. Howard, president; Charles H. Leonard, 41 Arlington St., Chicopee Falls, treasurer; and Lewis I. Howard.

The Penn Seaboard Steel Co. has acquired the Titusville Forge Co. and the Rockaway Rolling Mills.

The Chicago branch of the Driver-Harris Company, of Harrison, N. J., has been moved to larger quarters at 562 West Randolph Street.

Trade Catalogs

"Union" Tooth Cutters. Union Twist Drill Co., Athol, Mass. A twelve-page catalog describing the high power undercut tooth cutters with the latest developments and improvements. The illustrations show a variety of cutters for use on high power milling machines. Space is devoted to side and face mills, helical cutters and twist drills.

Control Handbook: The Electric Power Club, 1017 Olive St., St. Louis, Mo. A thirty-page booklet containing simple descriptions of controllers for electric motors and definitions of the terms used in that connection. It is an excellent aid to those using electrical control apparatus as it gives information which all those engaged in that industry should know. The handbook is sold for twenty-five cents and can be obtained from the Secretary of the Club, S. N. Clarkson.

Brown Pyrometers. The Brown Instrument Co., Philadelphia, Pa. A circular describing some installations of Brown pyrometer controls in steel mills.

Brass Rod. Bridgeport Brass Company, Bridgeport, Conn. A circular describing the all Ledrite brass rod, chamfered on both ends.

Low-pressure Gas Inspirators. The Surface Combustion Co., New York City, N. Y. Catalog No. 3-D describing and illustrating, with complete specifications, a line of low-pressure gas inspirators, claimed to be applicable to any make of gas furnace.

Evaporator Systems. The Griscom-Russell Co., New York City, N. Y. Bulletin No. 360 describing the G-R evaporator systems for the economical production of distilled boiler feed water.

Forthcoming Meetings

Society of Industrial Engineers: Annual meeting April 26, 27 and 28, Detroit, Mich. G. C. Dent, 327 La Salle St., Chicago, Ill., business manager.

American Welding Society: Annual meeting, Engineering Societies Building, New York City, April 26 to 29.

National Association of Manufacturers: Annual meeting, Waldorf-Astoria Hotel, New York City, May 8, 9 and 10. Secretary, George Boudinot, 50 Church St., New York.

American Society of Mechanical Engineers: Spring meeting, Atlanta, Ga., May 8 to 12. Secretary Calvin W. Rice, 29 West 39th St., New York City.

National Supply and Machinery Dealers Association: Annual Convention, Atlantic City, May 8 to 10. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, Thomas A. Fernley, 505 Arch St., Philadelphia, Pa.

Foreign Trade Council: Annual Convention, Philadelphia, Pa., May 10 to 12. Secretary, O. K. Davis, 1 Hanover Square, New York City.

United States Chamber of Commerce: Annual meeting, Washington, D. C., May 16 to 18. Secretary, D. A. Skinner, Riggs Bldg., Washington, D. C.

National Association of Office Managers: Annual meeting, Washington, D. C., May 18 to 20. Secretary, F. L. Rowland.

American Society for Steel Treating: Pittsburgh Section meeting, Bureau of Mines Auditorium, Pittsburgh, Pa., May 25 and 26.

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

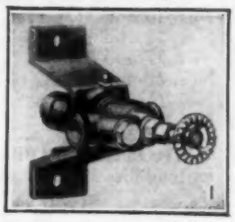
American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Burners, Gas, Furnace, Industrial
Chicago Flexible Shaft Co., Chicago, Ill.
"American Machinist," January 12, 1922

The high-pressure burner illustrated is operated by air at a pressure of 10 lb. per square inch or over, or by dry steam at a pressure of 25 lb. per square inch. A combination high- and low-pressure burner is furnished for operation with compressed air at the same pressures and with blast air at from 4 to 6 oz. pressure. Only sufficient compressed air to atomize the oil is used, while the remaining air for combustion is supplied by a fan at low pressure. An intermediate pressure burner is also furnished for operation with air at from 1½ to 2 lb. pressure per square inch, supplied from a positive-pressure blower.



Furnace, Tempering, Oil, Stewart
Chicago Flexible Shaft Co., Chicago, Ill.
"American Machinist," January 12, 1922

This oil-fired furnace is intended for tempering dies, tools, punches and knives. The oil bath is headted slowly to a temperature of not more than 700 deg. F., and then is allowed to cool down rapidly to permit the addition of a new charge. The furnace is made in five sizes. Gas can be used as fuel. The weight varies from 355 to 1,550 pounds.

Forge, Gas or Oil, Stewart, No. 1
Chicago Flexible Shaft Co., Chicago, Ill.
"American Machinist," January 12, 1922

The forge is used in welding and in miscellaneous forging work, as well as for heating rods and bolts prior to upsetting. Combustion occurs both beneath and at the sides of the opening, the flame striking the work directly. It is said that high heats are obtainable with economy of fuel, either gas or oil being employed. Opening, 12 x 2 in. Inside depth, 8 in. Floor space, 32 x 24 in. Weight, 800 pounds.

Forge, Hammer, Large, Stewart
Chicago Flexible Shaft Co., Chicago, Ill.
"American Machinist," January 12, 1922

The furnace handles large forging work and is equipped with large burners to give high welding heat, and with provision for running off the slag at the rear. Doors may be provided at each end. Either oil or gas may be burned. The furnace is made in a range of sizes, and the smaller ones are mounted on legs. The larger sizes are of the iron-plate and fire-brick type, and are built on brick foundations. This form of furnace is adaptable to heating forging and welding work for steam hammers. Chamber: smallest size, 27 in. wide, 36 in. deep; largest size, double-door type, 99 in. wide and 63 in. deep. Sill height, 27 in.

Forge, Rivet, Oil, Portable, Stewart, No. 6
Chicago Flexible Shaft Co., Chicago, Ill.
"American Machinist," January 12, 1922

The forge is for use on either machine or hand work, burns oil, and employs compressed air for atomization. The oil is forced to the burner and atomized by the compressed air from the shop line, reduced to 20 lb. per square inch pressure by a regulating valve. An asbestos flame shield and blast pipe protect the operator. If desired, the forge may be mounted on a truck. Chamber of furnace: 12 in. wide, 12 in. deep; opening, 3 in. high, 7 in. wide. Height from floor to top of sill, 40 in. Oil capacity, 30 gallons.

Furnace, Crucible, Stewart, No. 200
Chicago Flexible Shaft Co., Chicago, Ill.
"American Machinist," January 12, 1922

This crucible furnace is for use in lead or cyanide hardening, soft-metal melting, tinning and galvanizing. It is stated that the position of the burner gives the flame a rotary motion that results in a uniform distribution of heat around the pot. The pressed-steel pot is 14 in. in diameter and 14 in. deep. A No. 5 blower is required. Either gas or oil may be used as fuel. Floor space, 36 x 36 in. Weight, 1,300 pounds.

Furnace, Gas, High-Speed Steel, Double-Deck
Chicago Flexible Shaft Co., Chicago, Ill.
"American Machinist," January 12, 1922

The upper chamber of the furnace is used for preheating, and is heated by the waste gases from the lower chamber. The lower chamber is fitted with carbofrax slabs to withstand the high temperature. Combustion takes place under the floor. Linings are 4½ in. thick, with special insulation 1 in. thick. The furnace is made in five sizes, with openings varying from 5 x 9 to 6 x 12 in. Floor space: smallest size, 28 x 30 in.; largest size, 36 x 40 inches.

Press, Hydraulic, Forcing, Reversed Cylinder
Watson-Stillman Co., 50 Church St., New York, N. Y.
"American Machinist," January 12, 1922

The machine is intended especially for pressing in and out locomotive driving-box brasses or pressing on and off gear or disks in railroad and other machine shops. A power-driven pump applies the pressure and a handwheel controls the motion of the ram. A jib is furnished with a trolley for attaching a chain hoist. Drive may be by belt or by direct-connected constant-speed motor. A gage indicates pressure on the ram in pounds per square inch, and also the total pressure in tons. The pump used is of the two-plunger type, and the entire control of the press is through a single valve. Capacity, 75 tons. Ram movement, 21 in. Bottom platen, 72 in. long.

Clip, paste on 3 x 5-in. cards and file as desired

The Weekly Price Guide

THIS WEEK'S MARKET

Advances—Steel shapes, plates and mild steel bars quoted at $1.60 per 100 lb., Pittsburgh. Orders where specifications are especially attractive to makers and buyers are not particular as to deliveries, represent the only quotations remaining at $1.50. Advancing fuel costs causing firmness in pig iron at Pittsburgh; demand for basic iron keen in Youngstown and price advance anticipated in Birmingham. Bolts and nuts advanced 10 per cent at Pittsburgh mill; steel sheets firmer.

Tin quoted at 32¼c. as against 31c.; lead, 5⅝c. advanced from 5¼c. and antimony 5¼c. as compared with 5¼c. per lb. in New York warehouses. Cleveland quotes antimony at 6¾c. as against 6¼c. per lb.

Raw linseed oil at 89c. in New York as compared with 84c. per gal. (5 bbl. lots) one week ago.

No Declines—Copper quiet; zinc showing better demand with prices unchanged.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$21.00
Northern Basic	21.02
Southern Ohio No. 2	21.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	26.87
BIRMINGHAM	
No. 2 Foundry	16.50
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	22.26
Virginia No. 2	28.74
Basic	20.25
Grey Forge	21.00
CHICAGO	
No. 2 Foundry local	20.70
No. 2 Foundry, Southern, sil 2.25@2.75	22.67
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	21.46
Basic	20.46
Bessemer	21.46

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	10.0	6.0	4.0
Philadelphia	8.0	5.0	2.65
Atlanta	5.5	4.5	4.0
Detroit	7.0	4.5	3.0
Birmingham	12.0	6.5	3.0
Denver	8.0	6.0	5.0
New Orleans	6.0	4.5	3.5
Minneapolis	9.0	6.0	4.5
New York	9@10	6.0	3.0
Cincinnati	6.0	5.0	4.5
Cleveland	6.75	4.5	2.6

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.40	3.28	3.10	3.38
No. 12	2.45	3.33	3.15	3.43
No. 14	2.50	3.38	3.20	3.48
No. 16	2.70	3.48	3.30	3.58
Black				
Nos. 17 and 21.	3.00	4.05	3.55	4.10
Nos. 22 and 24.	3.05	4.10	3.60	4.15
Nos. 25 and 26.	3.10	4.15	3.65	4.20
No. 28	3.15	4.25	3.75	4.30
Galvanized steel sheets:				
Nos. 10 and 11.	3.15	4.25	3.75	4.30
Nos. 12 and 14.	3.25	4.35	3.85	4.40
Nos. 17 and 21.	3.55	4.65	4.15	4.70
Nos. 22 and 24.	3.70	4.80	4.30	4.85
No. 26	3.85	4.95	4.55	5.00
No. 28	4.15	5.25	4.75	5.30

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Inches	Iron Black	Galv.
		BUTT WELD			
1 to 3	71	58½	⅜ to 1¼	44½	29½
		LAP WELD			
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1¼	69	57½	⅜ to 1½	44½	30½
2 to 3	70	58½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded.	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded.	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. **Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.**

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (bas)	6.00	6.00	6.00
Coppered Bessemer rods(base)	7.00	8.00	6.03
Hoop steel	3.38	2.56	3.13
Cold rolled strip steel	6.25	8.25	6.35
Floor plates	4.60	4.56	4.98
Cold finished shafting or screw	3.35	3.00	3.30
Cold finished flats, squares	3.85	3.50	3.80
Structural shapes (base)	2.48	2.31	2.38
Soft steel bars (base)	2.38	2.21	2.28
Soft steel bar shapes (base)	2.38	2.21	2.28
Soft steel bands (base)	2.98	....	2.88
Tank plates (base)	2.48	2.31	2.38
Bar iron (2.00@2.10 at mill)	2.38	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
⅜	8.00		12@13
¼	6.50		11@12
5/32 to ¼	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	13.62½
Tin, 5-ton lots, New York	32.12½
Lead (up to carlots), St. Louis, 5.27½; New York	5.62½
Zinc (up to carlots), St. Louis, 5.27½; New York	5.62½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.75	6.25
Copper sheets, base	19.50@20.50	20.50@21	23.00
Copper wire (carlots)	14@14.25	17.00	16.25
Copper rods (ton lots)	19.25	21.50	19.50
Copper tubing (100-lb. lots)	20.75	22.50	23.00
Brass sheets (100-lb. lots)	16.25	16.50	18.75
Brass tubing (100-lb. lots)	18.00	18.50	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	14.25	16.00	15.75
Brass wire (carlots)	16.75	17.75	.....
Zinc sheets (casks), (8% dis. carlots)	9.50	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J	39.00	.....	.....
Solder (½ and ½), (caselots)	18.00	22.00	19.00
Babbitt metal (best grade)	30.80	39.50	36.00
Babbitt metal (commercial)	15.50	13.50	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.50	10.25
Copper, heavy, and wire	9.50	9.50	9.25
Copper, light, and bottoms	8.50	8.50	8.25
Lead, heavy	3.75	3.75	3.65
Lead, tea	2.75	2.75	3.00
Brass, heavy	5.75	5.50	8.00
Brass, light	4.25	4.00	4.75
No. 1 yellow brass turnings	5.00	5.50	5.00
Zinc	2.75	2.25	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	11.00	14.50
IC,	112 sheets	12.80	11.40	14.80
Terne Plat				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	5.60	7.25
IC,	14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.09
Wiping cloths per M., 13¼x13¼	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.89	.95	.90
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	$3.25@$3.50	
Coke, prompt foundry, Connellsville	per net ton	$4.25@$4.75	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in	60-5%	60-10%	60%
1½ and 1¼x3 in. up to 12 in	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	.....	65-5%
Lag screws, coach screws	65%	.....	60-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	50-10%	60-10%	50-5%
Bolt ends, with hot pressed nuts	60%	.....	55%
Tap bolts, hex. heads	25%	.....	.....
Semi-finished nuts ⅝ and larger	75%	75-10%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	60-10%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ⅞-in., ¾-in., 1x2 in. to 5 in., per 100 lb (net)	$3.35	$3.25	$3.00
Cone heads, ditto (net)	3.45	3.35	3.10
1½ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.35 base
Copper rivets	60-5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50-5%	60-10%
Medium grade	40-5%	40-10-2½%	50%
Heavy grade	35%	40%	40-5%
Rubber and duck:			
First grade	60-5%	50-10%	40-10%
Second grade	60-10-5%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

New and Enlarged Shops

Machine Tools Wanted

Ala., Mobile—The Alabama Drydock Co., Foot of Eslava St., is not in the market for two 27 in. LeBlond lathes and one No. 4 LeBlond milling machine as published in our issue of March 23.

Conn., Stratford—J. G. Robson—No. 3 Bardons and Oliver screw machine, (used), also No. 2, No. 3 and No. 4 forging machines.

Ill., Chicago—The Atchison, Topeka & Santa Fe R.R., 80 East Jackson Blvd., M. J. Collins, Purch. Agt.—one 4 spindle combined turning end threading machine; one angle iron bending roll 4 in. x 4 in. x ½ in.; one splitting shear, heavy duty type up to 1¼ in.; one gate shear 10 ft. long, 20 in. throat ⅜ in. capacity; one 6 ft. radial drill; one 72 in. squaring shear ½ in. capacity; two 24 in. drills Barnes, all geared; one hot saw heavy duty type power feed for cutting locomotive T bars.

Ill., Chicago—A. Hess, 1219 South Western Ave.—one No. 30 punch press weight about 3,000 lb. also one small three spindle Fox drill and one small power square shears.

Ill., Chicago—The International Harvester Co., 606 South Michigan Ave., Purch. Dept. Erie steam hammer, 4,000 lb. (used).

Ill., Chicago—The Printing Mchy. Co., 505 Fisher Bldg., Van Buren and Dearborn Sts., H. T. Simpson, Purch. Agt.—duplex milling machine.

Ind., LaPorte—The L. A. Althoff Mfg. Co., Inc., of LaPorte has taken over assets and liabilities of the L. A. Althoff Co. of Illinois and will install few machine tools and other equipment.

Ind., Marion—The Allmur Mfg. Co., manufacturer electric cook stove, L. L. Kimmel, Purch. Agt.—No. 4 consolidated punch press or its equivalent.

Mass., Springfield—P. S. Stauffer & Son, 67 Governor St., manufacturer of sheet metal stamping equipment—20 in. back geared drill press.

Mich., Detroit—W. L. Howarth, 4323 Trumbull Ave.—No. 5 or No. 6 Toledo geared press or its equivalent.

Mich., Detroit—J. F. Lamb Co., 1938 Franklin St.—miscellaneous machine shop equipment including motors, ⅓ to ¼ hp., 110 volt, 60 cycle, single phase.

Mich., Halfway—C. F. Kaiser—complete equipment for repair shop, including blacksmith tools and equipment, drill press, etc., (used).

Mich., Northville—E. E. Perkins, Route 2—drill press; combination band, rib and cut-off saw, electric blower; one direct current, 7 hp. motor, also a complete set blacksmith's tools.

Mich., Wyandotte—The All-Metal Products Co., Labodie St.—ten Niagara presses Nos. 3, 4 and 5 also one Van Norman milling machine No. 2.

Minn., Minneapolis — The Armstrong Transfer & Storage Co., 320 7th St., S. E., F. H. Armstrong, Pres.—power machine tools for auto repair shop.

Minn., Minneapolis—O. M. Nelson, 65 Western Ave.—machine tools equipment for auto repair shop at 317 8th St. S.

Mo., Joplin—E. Cox & Son, 313 East 3rd St., E. Cox, Purch. Agt.—power lathe.

Mo., Joplin—The Jobson Auto Repair Co., 311 Virginia Ave., M. Jobson, Purch. Agt., —drill press and lathe for power.

Mo., Kansas City—The Jobson Furnace Co., J. J. Jobson, Purch. Agt.—tinners tools including square shears and notching press.

Mo., St. Louis—The Natl. Lead Co., 722 Chestnut St., W. M. Lowry, Purch. Agt.—punch press to punch ⅞ in. diameter hole in 1 in. plate or heavier; one forming roll to handle ¼ in. plate, also 100 ft. steel head frame; one shear with 24 in. throat or longer to cut ¼ in. plate; one 300-350 cu.ft. air compressor, 100 lb. pressure, motor or belt driven, A.C. direct connected preferred.

Neb., Lincoln—The Holland Furnace Co., 843 O St., D. Van Lente, Purch. Agt.—small sheet metal crimping machine.

Neb., Lincoln—The Ideal Auto Tinners (Sharton and Derrick), 918 N St., B. Derrick, Purch. Agt.—one 30 in. folder and one 40 in. square shear.

Neb., Sidney—J. Treinan—lathe about 18 in. x 10 ft. bed, (used).

N. J., Newark—Kreuter & Co., 571-585 18th Ave., manufacturers of mechanics tools, W. H. Hall, Purch. Agt.—No. 14 Gardner grinder complete with counter shaft, water pumps, etc.

N. Y., Adams Center—Williams Garage Co., Main St., C. Williams, Purch. Agt.—electric driven blower; forge parts and castings for built in forge; small high speed upright drill for electric drive. (new or used).

N. Y., Binghamton—F. Sprout, Collier and State Sts.—complete equipment for automobile and engine repair.

N. Y., Buffalo—W. G. Day, 2120 Fillmore Ave.—machinery and equipment for radiator and auto repair station.

N. Y., Buffalo—H. R. Sontag, 1896 Niagara St.—equipment for automobile and machine repair shop.

N. Y., Buffalo—M. M. Swerdloff, 424 Prudential Bldg.—tools and equipment for repairing automobiles.

N. Y., Buffalo—R. E. Williams, 809 Iroquois Bldg., (contractor)—machinery for the manufacture of light metal and woodwork.

N. Y., Farnham—Ingraham & Pizzolanti —machinery and equipment for garage now in course of construction.

N. Y., Rochester—The North East Electric Co., 348 Whitney St., A. M. Anderson, Purch. Agt.—one 2 spindle No. ½ bench type Avey drill; one No. 2 Avey tool room drill; one No. ½ Avey single spindle column type drill; one 3 spindle No. ½ Avey column type drill and one 2 spindle No. 1 Avey drill.

N. Y., Utica—E. Steinhorst Co., Mohawk and Eagle Sts., E. Steinhorst, Purch. Agt.—power driven sheet metal working tools and equipment.

N. Y., Vernon—Uebler Mfg. Co., manufacturer milking machines, J. S. Ferris, Secy. and Treas.—power punch press.

N. Y., Watertown—The Gould & Gould Mfg. Co., 732 Cooper St., R. D. Gould, Purch. Agt.—small machine tools and special equipment for the manufacture of jewelry.

O., Cincinnati—The Jones Machine Tool Co., 435 East Pearl St., W. F. Jones, Purch. Agt.—one 42 in. x 18 ft. center lathe for stone cutting; No. 23 New Britain automatic; one 1½ in. bolt cutter; one open back inclinable stamping press plain or geared, weighing 2,500 to 7,000 lb. with stroke from 3 to 4 in.; one 48 in. x 20 ft. lathe; 48 in. x 16 ft. modern planer, motor driven, d.c. current, 220 volts.

O., Cincinnati—The Pollack Steel Co., Carthage Ave., G. J. Myers, Purch. Agt.—Massillon No. 5 trimming press, 16½ in. die space, etc., or its equivalent.

O., Cleveland—The Central Brass Mfg. Co., 6203 Cedar Ave., manufacturer drinking fountains, faucets, valves, etc., L. S. Fisher, Purch. Agt.—No. 33 New Britain standard chucking machine.

O., Cleveland—The Economy Plumbing & Heating Co., 12302 St. Clair St.—wood turning or machine bench lathe about 9 in. swing and 3 ft. bed.

O., Cleveland—The K. W. Ignition Co., Chester and East 30th Sts., A. Barr, Purch. Agt.—one 50 ton power press with 4 in. stroke.

O., Cleveland—Parish & Bingham Co., Madison and West 106th Sts.—one No. 5½ consolidated press.

O., Columbus—E. H. Huffman & Sons, 243 South 4th St., E. H. Huffman, Pres.—general service station machinery including drill presses, small lathe and grinding machine.

Pa., Cherry Tree—The Cherry Tree Machine Co., J. L. Stiffler, Purch. Agt.—
One No. 62 Fellows gear shaper with standard change gears.
One horizontal boring mill with 3 ft. x 5 ft. table, 30 in. traverse of bar, etc.
One 20 in. engine lathe capable of taking 6 in. between centers.
One Hexagonal turret lathe.
One 2 head wheel turning lathe capable of swinging 36 in. and approximately 40 in. to 60 in. between centers.
One Centerless grinder for grinding axels, etc., to take shafts 1 in. to 4 in. diameter.
One drill grinder for drills up to 1½ in.
Two wheel grinders.
One 24 in. shaper.
One Universal milling machine.
One 4 ft. to 5 ft. Universal or semi Universal radial drill.
One 2 or 3 spindle sensitive drill press capable of driving ¾ in. diameter drills.
One 200 ton capacity hydraulic wheel press.

Pa., Erie—H. C. Cowley, 1139 East 28th St.—one 14 in. or 16 in. lathe and small grinder.

Pa., Phila.—The Art Furniture Mfg. Co., 835 Race St.—one 16 in. swing wood turning lathe.

Pa., Phila.—B. Luberman, 20th St. and Allegheny Ave.—equipment for machine shop.

Pa., Phila.—The Ritter Can & Specialty Co., 1026 Sedgeley Ave.—equipment for the manufacture of metal working machinery, including shears (Bench & Circle), furnaces, brakes, etc.

Pa., Rockview (Lemont P. O.)—The Western Pennsylvania Penitentiary—lathe, floor grinder, drill press, pipe machine, and a 48 in. power grindstone.

Pa., Troy—The Bailey & Powers Co.—complete machine tool equipment for gas engine repair.

Va., Richmond—Anderson & McMullen, 2047 West Broad St.—small lathe and a drill press for auto repair shop.

Va., Richmond—The Anderson Motor & Sales Corp., 1815 West Broad St.—lathe, drill press buffing machine and bench tools for auto repair work.

Va., Richmond—F. L. Benton, 1649 West Broad St.—lathe, drill press, buffing machine and bench tools for auto repair work.

Va., Richmond—The Bitner Motor Corp., 301 North Gilmore St.—cylinder grinding machine and small lathe.

Va., Richmond—C. E. Booth, Jr., 916 West Broad St.—lathes, drill press and bench tools for auto repair work.

Va., Richmond—A. I. Fleming, 1623 West Broad St.—lathes and a drill press, (used).

Va., Richmond—Fulton & Barnes, 1643 West Broad St.—cylinder grinder.

Va., Richmond—Gann, Barlow & Crow, 335 Mumford St., A. Gann, Purch. Agt.—drill press and lathe.

Va., Richmond—The Owens Motor Co., 2100 West Broad St.—lathe, drill press, buffing machine and bench tools for auto repair work.

Va., Richmond—J. K. Bohannon, 722 West Broad St.—drill press.

Va., Richmond—Shinaults Bicycle Shop, 506 West Broad St.—small lathe and buffing machine.

Va., Richmond—Stuart-Warner Service Co., 1615 West Broad St.—power grinder, bench drill.

W. Va., Charleston—The State Rd. Comn. —one power shear 96 in. blade; power punch press 40 ton capacity; one air compressor.

W. Va., Wheeling—The Dillon Bros. Machine Co., 8 South Huron St.—forging hammers and other tools for new shop at Bridgeport, O.

Wis., Appleton—The Gibson Auto Exchange Co., College Ave.—auto repair shop equipment for proposed garage and repair shop on College Ave.

Wis., Beaver Dam—H. Brueckner—auto repair equipment and machinery for proposed garage and repair shop on Main St.

Wis., Beloit—J. Terwilliger, 318 Broad St.—equipment for auto repair shop including air compressor, 1 ton press, etc.

Wis., Cudahy—F. Barnhardt, 919 Packard Ave.—sheet metal working machinery.

Wis., Kenosha—The Krisor Bros., 772 Milwaukee Ave.—air compressor, gas storage tank and pump and bench tools for proposed garage on Milwaukee Ave.

Wis., Milwaukee—The Bd. Educ., 10th and Prairie Sts.—one 14 in. x 6 ft. Hamilton tool room lathe; No. 3 Arbor press; No. 2 Brown & Sharpe surface grinder; six 11 in. x 4 ft. and six 13 in. x 5 ft. engine lathes, also various other equipment.

Wis., Milwaukee—E. Meister, 501 Harmon St. (garage)—repair shop equipment including drill press.

Wis., Sturgeon Bay—The Sturgeon Bay Garage, M. Peterson, Purch. Agt.—drill press, air compressor, lathe, gas storage tank with pump jacks.

Ont., Ridgetown—H. E. Cavell—equipment for small general repair shop at Listowel, including lathe, planer, shaper and drill press.

Ont., Walkerville—The Gotfredson-Joyce Corp., Ltd.—machinery for proposed garage on Spadina Ave., Toronto.

Machinery Wanted

Conn., Shelton—Sidney Blumenthal & Co., Inc., manufacturer of pile fabrics, O. J. Bell, Purch. Agt.—Davis & Furber 82 in. brass plate warp reels with single beamers complete.

Fla., Tampa—The City, A. W. D. Hall, Mgr.—freight handling machinery, electric trucks, etc. for modern ship terminals.

Fla., West Palm Beach—The Palm Beach Creamery Co., A. F. Neilson, Pres. —dairy and ice cream manufacturing equipment.

Ia., Ft. Dodge—The Fort Dodge Culvert & Steel Co., manufacturer of bars, shapes, culvert pipe, etc., R. M. Stevens, Secy.-Treas.—roughing mill 18, 20 or 22 in. of one, two or three stands with usual equipment, also steam engine to operate above mill and a present 10 in. mill besides.

Ill., Chicago—The Chicago Pump Co., 2336 Wolfram St.—planer-type milling machine with adjustable rail having two vertical heads and one or two horizontal heads with table 36 in. wide and 10 ft. or longer, Ingersoll or Newton make preferred.

Ill., East Peoria—(Peoria P. O.)—The Crown Fdry. Co.—complete equipment for the manufacture of gray iron, chilled and semi-steel castings.

Ill., Rochelle—The Caron Spinning Co., Inc., manufacturer of yarns—one single apron wool dryer similar to Sargents, capacity 2,000-3,000 lb. daily.

Ind., Alexandria—The Ziegler Mfg. Co., metal stampings and screw machine products, L. A. Ziegler, Purch. Agt.—rotary annealing furnace, similar to the Rockwell 153.

Mich., Detroit—The Adams Lithograph Co., 307 West Congress St.—lithographing machinery and equipment.

Mich., Detroit—P. Kirschbaum & Son, 3776 Woodward Ave.—Eastman cloth cutting machine with straight blade.

Mich., Detroit—The Peninsular Paper Can Co., 1725 Hastings St.—stencil cutting machines.

Mich., Detroit—J. B. Warren, 337 Bagley Ave., printers and printers supplies—14 x 22 in. job press.

Mich., Highland Park (Detroit P. O.)—S. J. Howe, 200 McLean Ave.—complete equipment for the manufacture of paint.

Mo., Joplin—G. B. Bartlett, 1204 Illinois St., (printer)—10 x 15 printing press.

Mo., Joplin—The Joplin Store Fixture Exchange, 713 Bway., R. Gilstrah, Purch. Agt.—power buffing and polishing machinery.

Mo., Joplin—A. E. Maitland, 301 Virginia Ave.—mining machinery and belting.

Mo., Joplin—The Williams Sash & Door Wks., 514 North Main St., J. P. Williams, Purch. Agt.—dove tail machine for making boxes.

Neb., Lincoln—The Lincoln Traction Co., Terminal Bldg., A. G. McMaster, Purch. Agt.—air compressor, 50 cu.ft., (used).

N. J., Newark—The Newark Billiard Table Co., 478 Market St.—leather splitting machine about 18 in. cutter.

N. Y., Bath—The Bath Roller Mills, J. Faucett, Prop.—machinery and equipment for roller mill.

N. Y., Binghamton—The Binghamton Glass Wks., 28 Crandell St.—glass furnace to replace one recently destroyed by explosion.

N. Y., Buffalo—The Bd. Educ., D. J. Sweeney, Secy.—receive bids until April 30, for furnishing the manual training departments with brads, screws and small supplies for year ending Apr. 30, 1923.

N. Y., Buffalo—The Buffalo City Hospital, 462 Grider St., G. S. Staniland, Secy. —receive bids until May 8 for refrigeration and ice making machinery.

N. Y., Buffalo—The Interstate Paint & Supplies Co., Inc., address M. A. Harrington—machinery, tools and equipment for use in manufacture of chemicals and paints.

N. Y., Buffalo—D. Kern, 83 Roesch St.—bakeshop equipment.

N. Y., Buffalo—The Queen City Plating Wks., 103 Sycamore St.—machinery for proposed plating and buffing factory at 566 Michigan Ave.

N. Y., Buffalo—J. Schaaf, Miller Ave. and West Shore R.R.—machinery for proposed shoe factory on Northampton St.

N. Y., Buffalo—Walton & Hoffman, 648 Ellicott St.—machinery for peeling, slicing, sacking and canning potatoes for potatoe chips. Proposed factory at 85 Demond Pl.

N. Y., Gouverneur—The Gouverneur Marble Quarries, J. H. O'Brien, Purch. Agt. —hoisting machinery and marble sawing equipment.

N. Y., Naples—The New York Pea Packers Inc., J. F. Connor, Mount Morris, Purch. Agt.—special machinery and equipment for canning fresh vegetables and fruits. (For several plants.)

N. Y., Olean—W. F. Foss & Son—machinery and equipment for bakery.

N. Y., Syracuse—The Syracuse Boys Club, 436 East Jefferson St., F. K. Zerbee, Secy.—$1,000 worth of woodworking machinery, including a band saw and planer.

N. Y., Watertown—D. C. Hunt Co., 534 Mill St.—bread and pastry mixing and baking machinery and equipment, complete outfit.

N. Y., Watertown—Smith Bros. Constr. Co., Cleveland Bldg., S. D. Smith, Purch. Agt. —complete outfit and equipment for field blacksmith shop.

O., Cincinnati—The W. T. Johnston Co., 3rd and Vine Sts., J. M. Howard, Purch. Agt.—one 7 in. x 10 in. D. D. D. C. hoisting engine; one 8 in. x 10 in. double drum, double cylinder hoisting engine and a jaw stone crusher.

O., Cleveland—F. J. Albany, Sweeney Ave. and East 55th St.—machinery and equipment for the manufacture of concrete laundry tubs.

O., Cleveland—The Fanner Mfg. Co., Brookside Park, J. E. O'Brien, Purch. Agt. —one 661 Toledo embossing press for foundry.

O., Cleveland—The Sanitary Wet Wash Laundry Co., East 93rd St.—laundry machinery and equipment.

Okla., Picher—The Fischer Harness Co., 400 Connell Ave., L. C. Fischer, Purch. Agt. leather working machinery.

Pa., Butler—The Standard Steel Car Co. —one 3-ton hand power crane for foreign shipment.

Pa., Clifton Heights—The Kent Mfg. Co., manufacturer of yarns—carders, twisters, dryers, etc.

Pa., Erie—The Erie Metal Furniture Co., Inc., E. Bauschard, Secy.—machinery for proposed metal furniture plant.

Pa., Girardville—C. H. Hein—knitting machinery for new addition to mill.

Pa., Phila.—The Berkley Knitting Co., 1326 Vine St.—machines of various styles: knitting machines and Rachel machines will also use electric power.

Pa., Phila.—Bla-Shone Hosiery Corp., Allegheny Ave. and Hancock St., M. Schoneman, Purch. Agt.—automatic hosiery machines and finishing machines.

Pa., Phila.—City Dept. of Highways, City Hall, F. C. Dunlap, Chief—Shone-Duplex ejector system for sewerage, 2 units, capacity 200 gal. per minute, to be installed complete.

Pa., Phila.—G. S. Cox & Bros., Inc., Cambria and Ormes St., haircloth manufacturers—revolving flat cords, drawing frames, improved twisters, etc., for new building.

Pa., Phila.—The Darlney Bros., Chester Ave. and Boynton St.—spinning machines, looms, carders, belting, shafters, etc., also machinery for repair shop.

Pa., Phila.—Dept. Pub. Wks., City Hall, F. Caven, Dir.—2 horizontal crank and flywheel double acting air compressors, 12 in. diameter cylinders, 10 in. stroke, 250 lb. per minute.

Pa., Phila.—T. Develin, Jr., Lehigh Ave. and Hancock St.—addition machinery for new carpet mills.

Pa., Phila.—G. Esslinger & Sons, 10th and Callowhill Sts.—conveyors and additional bottling machinery for brewery.

Pa., Phila.—R. Hirsh & Sons, 2720 North Hope St., S. Hirsh, Purch. Agt.—additional machinery for the manufacture of upholstering fabrics.

Pa., Phila.—Penn Screw Machine Wks., 712 Cherry St.—colletts and feeding fingers for No. O, B and S automatics.

Pa., Phila.—The Peerless Paper Box Mfg. Co., 1432 North Randolph St.—folders, cutters, saws, etc., also printing presses for new addition.

Pa., Phila.—The Roosevelt Worsted Co., 20th and Naudain St.—carders, looms, dryers and spinning machines.

Pa., West Chester—Hoopes Bros. & Thompson—one electric air pump and compressor for garage.

Tenn., Jellico—The Diamond Hosiery Mills—300-320 needle ribbing machines, Wildman or equal.

Tenn., Knoxville—The Duncan Mchy. Co., Dempster Bldg., 721 North Central St.—well machines without power, (new or used), No. 5 Gates gyratory crusher, manganese lining, (used), saw mills, portable engines, etc.

Wis., Antigo—The Mattefs Bros. Co., G. Mattefs, Pres.—woodworking machinery including saws, etc., for proposed saw mill on Main St.

Wis., Appleton—The Northern Boiler Structural Iron Co., Mills St.—special equipment for boiler plant including several tubular boilers and two traveling cranes.

Wis., Chippewa Falls—The Enterprise Oil Co., 401 Bay St.—pumps and filling station equipment for garage at Eau Claire

Wis., Fairwater—O. H. Riant—complete equipment for blacksmith shop and for repairing wagons, etc.

Wis., Holmen—The Holmen Creamery Assn., V. S. Keppel, Mgr.—modern equipment for proposed dairy.

Wis., LaCrosse—The Vocational School Bd., 60 Vine St., J. D. Coleman, Dir.—equipment for vocational school, incl. woodworking machinery, etc. Estimated cost, $2,000.

Wis., Lake Geneva—The Mann Candy Co., c/o F. Mann—refrigerating machinery for proposed ice cream factory.

Wis., Merrill—The Trantow Bros. Garage Co., c/o A. Trantow—equipment for auto repair shop including air compressor and a 1 ton press.

Wis., Milwaukee—A. J. Pietsch, 539 31st St.—additional woodworking machinery.

Wis., New London—Hamilton & Sons Canning Co.—special canning and power machinery.

Wis., Oshkosh—The Gibson Auto Co., 7 Church St.—auto repair equipment and small power unit machinery for garage and repair shop at Appleton.

Wis., Park Falls—The Flambeau Paper Co., G. Waldo, Mgr.—machinery and equipment for proposed paper mill.

Ont., Guelph—The Bd. Educ., H. J. Leadlay, Secy.—machinery, tools and equipment for general technical school work also physics and laboratory equipment.

Ont., Hamilton—The Kanadda Biscuit Co., Ltd., 185 West Ave. N.—motors and bakery equipment.

Ont., Staples—Hillman & Dalton—equipment for the manufacture of drain tile.

Ont., Wallaceburg—The Prestolock Co. of Canada, E. E. Theis, Mgr.—special machinery and equipment for the manufacture of radio equipment.

Metal Working Shops

Cal., Burlingame—H. C. Vielbaum, c/o J. W. F. Ryan, Engr., 1202 Bway., has awarded the contract for the construction of a 1 story garage on San Mateo Dr. near Howard Ave. Estimated cost, $40,000.

Cal., San Francisco—The Magnolia Metal Co., Pacific Bldg., has awarded the contract for the construction of a 1 story, 45 x 100 ft. metal plant on Bryant and Sterling Sts. Estimated cost, $10,000. Noted April 20.

Cal., San Francisco—The Wellman-Peck Co., 311 Embarcadero St., has awarded the contract for the construction of a 3 story addition to its garage and loft building on Embarcadero and Jackson Sts. Estimated cost, $40,000.

Conn., Wallingford—The International Silver Co., Meriden, has awarded the contract for the construction of a 1 and 2 story, 45 x 130 ft. and 30 x 30 ft. additions to its factory on Center St. here. Estimated cost, $30,000.

D. C., Langdon—The Fleischmann Co. has had plans prepared for altering and building an addition to its fermenter house here. Estimated cost, between $25,000 and $30,000. Milburn, Heister & Co., Union Savings Bank Bldg., Wash., D. C., Archts.

Ill., East Peoria—(Peoria, P. O.)—The Crown Fdry Co. recently incorporated, is building a plant for the manufacture of gray iron, chilled and semi-steel castings.

Ill., Paris—H. Link is having plans prepared for the construction of a 1 story, 66 x 140 ft. garage. Estimated cost, $40,000. Liese & Ludwick, 618 Temple Bldg., Danville, Archts.

Ill., Peoria—C. Welti, 518 Hamilton St., has awarded the contract for the construction of a 1 story, 70 x 120 ft. garage. Estimated cost, $40,000. Noted March 23.

Ill., Riverdale—The Riverdale Rolling Mill Co. has awarded the contract for the construction of a 1 story, 65 x 140 ft. rolling mill. Estimated cost, $25,000.

Mass., Medford—The Amer. Radio & Research Co. plans to build a 1 story, 60 x 120 ft. addition to its plant. Estimated cost between $30,000 and $35,000. Private plans.

Mass., Whitinsville—The Whitin Machine Wks., has awarded the contract for the construction of a 3 and 4 story factory; a 2 story garage and fire station and a gymnasium. Estimated cost, $500,000. Noted March 23.

Me., Augusta—The Waterville Motor Co., Waterville, is having plans prepared for the construction of a 2 story, 50 x 70 ft. service and repair station on Bangor St., here. Estimated cost, $40,000. H. T. Muzzy, 173 Main St., Waterville, Archt.

Minn., Minneapolis—C. F. Haglin & Sons, 226 Lumber Exchange Bldg., will build a 1 story, 132 x 165 ft. garage at 317 8th St., S. Estimated cost, $40,000. O. M. Nelson, 65 Western Ave., lessee.

Minn., Minneapolis—A. Hanson and M. C. Madsen, 848 Builders Exch. Bldg., have awarded the contract for the construction of a 2 story, 100 x 250 ft. garage and sales room at 2824-30 University Ave., S. E. Estimated cost, $65,000.

Mo., St. Louis—F. L. Cornwall, LaSalle Bldg., will build a 1 and 2 story, 130 x 137 ft. and 40 x 130 ft. service building on Sarah St. and Forest Blvd. Estimated cost, $75,000.

Neb., Havelock—Schmidt Bros. are having plans prepared for the construction of a 50 x 140 ft. garage. J. Tyler, 418 Richards Bldg., Lincoln, Archt.

N. Y., Binghamton—F. Sprout plans to build a 2 story repair shop and garage on Hawley, State and Collier Sts. Estimated cost, $40,000.

N. Y., Lowville—The G. A. Smith Co. plans to build a 1 story garage and machine shop on State and Jackson Sts. Estimated cost between $35,000 and $40,000.

N. Y., Watertown—The Watertown Garage Corp. plans to build a garage on State St. Estimated cost between $70,000 and $80,000. Address A. F. Lansing, Sherman Bldg.

O., Cincinnati—L. P. Hazen & associates, Court House, plan to build a 12 story garage on 100 x 140 site on 8th St. Estimated cost, $1,000,000. Architect not selected.

O., Cleveland—F. A. Maher, Wilton and Somerton Aves., has awarded the contract for the construction of a 1 story, 39 x 116 ft. garage at 2180 Lee Rd. Estimated cost, $40,000.

O., Cleveland—The Superior East 49th Co., c/o G. Paul, 611 Fidelity Mortgage Bldg., plans to build a 1 and 2 story garage and commercial building, on East 49th St. and Superior Ave. Estimated cost, $200,000. J. F. Steffens, 611 Fidelity Mortgage Bldg., Archts.

O., Dayton—The Bd. Educ. plans to build a 2 story, 60 x 300 ft. high school to include machine and wood working shops. Estimated cost, $1,500,000. Schenk & Williams, Mutual Home Bldg., Archts.

O., East Cleveland (Cleveland P. O.)—W. F. McCarty, 14840 Euclid Ave., has had plans prepared for the construction of a 1 story, 50 x 133 ft. garage and commercial building on Euclid Ave., here. Estimated cost, $40,000. Private plans.

O., Euclid—D. S. Blossom of the W. Bingham Co., West 9th St., Cleveland, has had plans prepared for the constructon of a 2 story, 48 x 76 ft. garage and stable on Richmond Rd., here. Estimated cost, $40,000. A. Garfield, Natl. City Bldg., Cleveland, Archt.

Pa., Butler—The Butler Buick Co. has awarded the contract for the construction of a 3 story, 83 x 110 ft. garage and sales room on Main St. Estimated cost, $150,000. Noted Feb. 23.

Pa., Phila.—E. Mervish, c/o J. E. Fieldstein, Archt., Otis Bldg., has awarded the contract for the construction of a 1½ story, 120 x 120 ft. garage on Frankford and Berk Sts.

Wis., Appleton—The Gibson Auto Co., 7 Church St., Oshkosh, is receiving bids for the construction of a 2 story, 40 x 100 ft. garage and repair shop on College St., here. Estimated cost, $40,000. C. R. Meyer & Sons Co., 52 State St., Oshkosh, Archts.

Wis., Appleton—The Northern Boiler Structural Iron Co., Mills St., is having plans prepared for the construction of a 1 story, 80 x 100 ft. boiler plant. Estimated cost, $70,000. E. Kottke, care of owner, Engr.

Wis., Beaver Dam—H. Brueckner is having plans prepared for the construction of a 1 story, 46 x 50 ft. garage on Main St. Estimated cost, $50,000. W. F. Bossman, Beaver Dam, Archt.

Wis., Beloit—J. Terwillizer, 318 Broad St., plans to build a 2 story, 73 x 120 ft. garage on Broad St. Estimated cost, $55,000. Architect not selected.

Wis., Eau Claire—The Enterprise Oil Co., 401 Bay St., Chippewa Falls, has awarded the contract for the construction of a 1 story, 60 x 70 ft. garage, etc., here. Estimated cost, $40,000.

Wis., Kenosha—J. Lindl, Archt., 209 Wisconsin St., is receiving bids for the construction of a 1 and 2 story, 60 x 100 ft. garage on Milwaukee Ave., for Krisor Bros., 772 Milwaukee Ave. Estimated cost, $42,000.

Wis., Merrill—The Trantow Bros. Garage Co., c/o A. Trantow, has awarded the contract for the construction of a 1 story, 52 x 120 ft. garage on 1st St. Estimated cost, $40,000.

Wis., New London—F. Schoenrock is having plans prepared for the construction of a 1 story, 60 x 100 ft. garage on Main St. Estimated cost, $45,000. Private plans.

Wis., Sheboygan—A. Locke, 1819 Calumet Rd., has awarded the contract for the construction of a 1 story, 46 x 142 ft. scrap iron factory on Calumet Rd. Estimated cost, $6,500.

Ont., Guelph—The Bd. Educ. has awarded the contract for the construction of a 2 story, 100 x 285 ft. technical school on Paisley St. Estimated cost, $262,500. H. J. Leadlay, Secy.

Ont., Listowel—H. E. Cavell, Ridgetown, plans to build a machine and general repair shop, here. Estimated cost, $5,000.

Ont., Port Colburne—The International Nickle Co. plans to build a 90 x 140 ft. addition to its factory, to be used for refining nickel and platinum. Architect not announced.

Ont., Toronto — The Gotfredson-Joyce Corp., Ltd., Walkerville, has awarded the contract for the construction of a 2 story, 51 x 210 ft. garage and service station on Spadina Ave. here. Estimated cost, $91,000. W. H. Leishman, 106 Jarvis St., Toronto, Mgr. Noted Nov. 24.

General Manufacturing

Cal., Sacramento—The State is having revised plans prepared for the construction of a printing plant on 11th and O Sts. Estimated cost, $140,000. W. F. McClure, Forum Bldg., State Archt.

Fla., West Palm Beach—The Palm Beach Creamery Co., plans to build a 2 story dairy and ice cream manufacturing plant, to consist of several units, on Okeechobee St. Estimated cost, $50,000. O. J. Williams, West Palm Beach, Archt.

Ia., Muscatine—The Muscatine Packing Co. has awarded the contract for the construction of a 5 story 100 x 200 ft. cold storage building; a 5 story, 50 x 100 ft. packing plant; a 5 story, 70 x 85 ft. abattoir and a 1 story, 50 x 100 ft. power house. Estimated cost, $200,000.

Ill., Chicago—The Atwell Printing & Binding Co., Sherman and Polk Sts., has awarded the contract for the construction of a 6 story, 170 x 177 ft. printing plant on Prairie Ave. and 20th St. Estimated cost, $700,000. Noted April 13.

Mich., Detroit—The Mills Baking Co., 5165 4th Ave., has awarded the contract for the construction of a 3 story bakery plant on 4th Ave. Estimated cost, $40,000. Noted April 6.

Minn., Mankato—The Mankato Co-operative Dairy Assn., will receive bids until May 1 for the construction of a 2 story, 50 x 122 ft. creamery. Estimated cost, $40,000. Schippel & Schmidt, Mankato, Engrs.

Minn., Minneapolis—The Strutwear Knitting Co., 731 East 14th St., has awarded the contract for the construction of a 2 story, 80 x 82 ft. factory on 6th St. and 11th Ave., S. Estimated cost, $50,000. W. A. Struthers, Secy. Noted Oct. 20.

N. Y., Binghamton—W. P. Hollingshead Co., 148 Oak St., plans to build a 5 story, 80 x 330 ft. chemical plant on Walnut St.

N. Y., Brooklyn—The General Baking Co., 343 Madison Ave., New York, has awarded the contract for the construction of a 2 story, 163 x 200 ft. bakery and a 2 story, 59 x 62 ft. stable on 149th St. and Girard Ave. here.

N. Y., Rochester—The Yawman Erbe Co., 424 St. Paul St., plans to build a 3 story factory for the manufacture of office furniture. Estimated cost, $100,000. Smith, Hinchman & Grylls, 710 Washington Arcade, Detroit, Mich., Archts.

N. Y., Rome—F. W. Kirkland, Archt., 103 West Dominick St., will receive bids until May 1 for the construction of a 2 story, 40 x 90 ft. milk pasteurization and bottling plant for the Rome Milk Corp. Estimated cost, $50,000.

O., Dayton—J. Newbauer Sanitary Milk Co., 18 Maryland Ave., has awarded the contract for the construction of a 2 story milk bottling and butter making plant on Herman and Maryland Aves. Estimated cost, $50,000.

Pa., Phila.—The Peerless Paper Box Co. has awarded the contract for the construction of a 2 story, 54 x 84 ft. addition to its factory at 1432 North Randolph St. Estimated cost, $50,000.

Pa., Pittsburgh—The St. Louis Independent Packing Co., 6349 Station St., is receiving bids for the construction of a 2 story, 106 x 109 ft. cooler building on Hamilton Ave. Private plans.

Tenn., Jacksonville — The Nashville Paper & Pulp Co. recently organized and chartered with $1,000,000 has leased several buildings and will erect several units for the manufacture of paper and pulp, at the Old Hickory Powder plant. R. G. Cullem, Engr. and Genl. Mgr.

Tenn., West Nashville—(Nashville P. O.)—Colyar Reese & Co., Memphis, plans to build a wholesale oil distribution depot here. Estimated cost, $100,000. Above company transferring from Memphis to West Nashville and will be operated here as Southern Oil Marketing Co.

Wis., Antigo—The Mattefs Bros. Co. is having plans prepared for the construction of a 1 story, 60 x 120 ft. saw mill on Main St. Estimated cost, $50,000. G. Mattefs, Pres. Private plans.

Wis., Blair—The Blair Canning Co., c/o A. J. Bee, is receiving bids for the construction of a 2 story, 50 x 70 ft. canning factory on Main St. Estimated cost, $25,000. Private plans.

Wis., Holmen—The Holmen Creamery Assn. is receiving bids for the construction of a 1 story, 72 x 72 ft. dairy. Estimated cost, $30,000. V. S. Keppel, Mgr. Private plans.

Wis., Lake Geneva—The Mann Candy Co., c/o F. Mann, has awarded the contract for the construction of a 2 story ice cream factory. Estimated cost, $10,000.

Wis., Manitowoc—The Manitowoc Products Co., 1008 Washington St., has awarded the contract for the construction of a 3 story, 50 x 70 ft. ice cream factory on Washington St. Estimated cost, $10,000.

Wis., Milwaukee—The Quality Dairy Co., 2347 Hadley St., has awarded the contract for the construction of a 2 story, 40 x 80 ft. dairy on Burleigh St. Estimated cost, $20,000. Noted April 6.

Wis., New London—Hamilton & Sons Canning Co. plans to build a 2 story, 50 x 75 ft. cannery. Estimated cost, $50,000. Architect not selected.

Wis., Park Falls—The Flambeau Paper Co. has awarded the contract for the construction of a 75 x 110 ft. paper mill. Estimated cost, $100,000. G. Waldo, Mgr. Noted April 6.

Ont., Acton—Beardmore & Co., 37 Front St., E., Toronto, is having plans prepared for the construction of a 3 story, 80 x 100 ft. tannery, here. Estimated cost, $100,000. Private plans.

Ont., Brantford—F. C. Bodley, Archt., Commercial Chambers, is receiving bids for the construction of a 2 story, 50 x 140 ft. dress goods factory, for the Dominion Dress Goods Co., 179 Dalhousie St. Estimated cost, $75,000.

Ont., Hamilton—The Kanadda Biscuit Co., Ltd., 185 West Ave., N., is having plans prepared for the construction of a 2 story, 80 x 400 ft. bakery. Estimated cost, $200,000. B. H. Prack, 1 Main St., E., Archt.

Ont., Niagara Falls—The Brant Creameries Co. is receiving bids for the construction of a 2 story, 40 x 80 ft. plant on Simcoe St. Estimated cost, $50,000. Architect not announced. Noted March 30.